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CEREBELLAR TUMOR.

RECOGNIZED CLINICALLY, DEMONSTRATED BY THE X-RAY, AND PROVED BY AUTOPSY.

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Any means of investigation which will facilitate the diagnosis of intracranial disease will be welcomed. Many investigators have sought the assistance of the X-ray apparatus in this connection; but, aside from its value in placing bony formations, bullets, and similar foreign bodies, it has failed to render any particular assistance. Obici and Ballici[1] were enabled to get trace of a growth by the X-ray in the case of a boy who had died from brain tumor, the examination being made post mortem. Subsequently, upon introducing tumors of various sorts within the brain-mass of cadavers, they satisfied themselves that localizing shadows could sometimes be secured. Similar experiments previously made by others had given negative results.

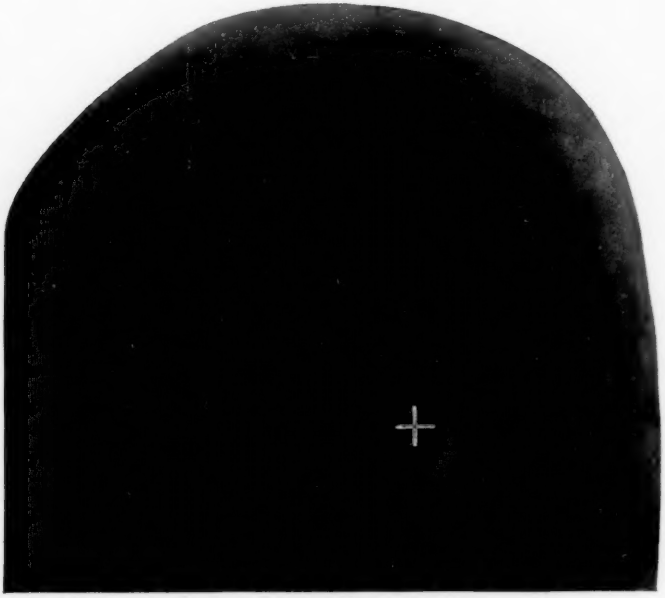
Through the courtesy and unusual skill of Mr. W. H. Fuchs, of Chicago, I was enabled in the case which is here briefly reported to secure two X-ray pictures which seemed to indicate strongly the presence of a growth in the right posterior cranial fossa. The case presented many of the classical symptoms of cerebellar tumor, enabling

[1] Rivista di Patholog., October, 1897.

me to make a diagnosis of such a growth, located probably on the right side, as indicated by the greater asthenia of the right limbs.

Upon reference to the skiagrams, Fig. 1 indicates the picture that might be seen as upon the fluoroscopic screen, the observer standing behind the patient. In Fig. 2 the observer would stand to the left of the patient, the light being on the right side of the head. The divergence of the rays from the luminous point will account for the extent of the shadow in these pictures when compared with the tumor subsequently obtained by section and represented in Fig. 3.

FIG. 1.

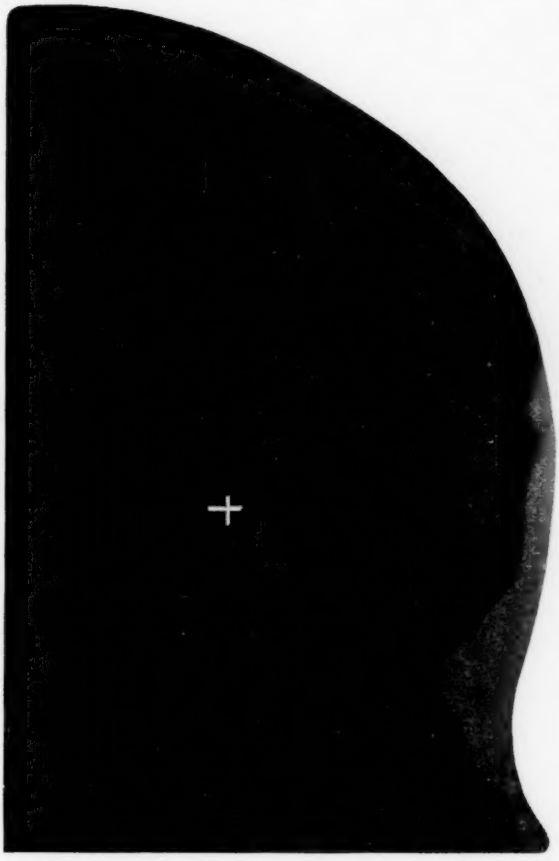


X-ray picture showing shadow made by right-sided cerebellar tumor. The white + is at about the centre of the shadow.

This boy was exhibited before a class of physicians at the Northwestern University Medical School in June, 1898, and the pictures were presented at that time as serving to prove the presence of the tumor and at the same time the value of the X-ray as a diagnostic agent. The supposition was expressed that the shadow could not be produced by a growth of a character homogeneous with that of the surrounding brain-tissue, and that in all probability it must be one of a highly vascular character, as it was presumed the blood in the tissues

of the tumor gave the shadow. This supposition was seemingly confirmed at the autopsy, as the tumor was found to be highly vascular, the seat of a number of old hemorrhages, and also to contain a considerable

FIG. 2.



X-ray picture showing shadow made by lemon-sized right-sided cerebellar tumor. The white + is at about the centre of the shadow.

sized clot of recent origin, the development of which had probably been the cause of the boy's sudden death. Calcareous masses would certainly give a shadow; and tuberculomata, dense fibromatous tumors, and thickly encapsulated abscesses and tumors might do so.

In each skiagraphic cut the centre of the shadow is indicated by a white cross, and it is interesting to note that on the negative of Fig. 2 a lobulated outline could be clearly distinguished and can also be seen upon the better prints made from the negative. A similar outline is seen in the transverse section of the tumor in Fig. 3. The tumor, from its relation to the fourth ventricle, was inoperable.

Mr. Fuchs states that it is important to make an exposure of proper duration, in order to secure these results; that under-exposure or over-

FIG. 3.

Photograph of brain containing cerebellar tumor, seen from above. The lateral ventricles have torn open. The tumor has been incised longitudinally.

exposure produces an entirely different picture. An ordinary focussing tube of proper vacuum was employed at a distance of eighteen inches from the photographic plate on which the head rested. The exposure was three and a half minutes.

John C. H., aged fifteen years, a schoolboy, was admitted to the Florence ward of St. Luke's Hospital, in the service of Dr. Church, March 7, 1898. The family history contained nothing noticeable in reference to this patient. His mother stated that previous to two years before the time of admission the boy's general health had been perfectly good; that he had been an active, intelligent, and energetic lad, strong and well developed. At the time indicated he had a number of attacks of vomiting, which usually came on early in the morning, preceded by a headache and attended by a cough. There did not seem to be a great deal of nausea, and the vomitus usually consisted of a quantity of thick,

yellow fluid. About seven months previous to hospital admission, the parents had noticed that he was uncertain on his feet, with a slight tendency to drag the right foot. The gait became more and more impaired, and at the time of admission was of the staggering variety, with perhaps a slight tendency to deviate to the right in walking forward. On the 14th of January previous he had a convulsion in the night. It lasted about half an hour, and as far as could be learned involved all four extremities about equally. On the 18th of that month, and on February 13th following, he had two other convulsions of a similar character; the muscles were rigid, and all four limbs were affected. He did not bite his tongue or froth at the mouth, but was extremely pale and entirely unconscious. Following the attacks he was sleepy, depressed, and apathetic for two or three days. Headaches of a severe character were a frequent complaint, the point of greatest intensity being usually in the occipital region, but sometimes the pains were frontal in location.

Upon admission the boy was noted to be a well-grown, rather flabby, pale, apathetic-looking individual, who was content to spend most of his time in bed, and usually complained of headache. He walked with a drunken stagger, departing about equally to the right and left, and was quite unable to walk a straight line. The control of the legs seemed to be quite inadequate, and the feet did not seem to be securely attached at the ankle-joint. Although he did not drag his toes, he was inclined to stumble over slight obstacles. The muscular strength in all four extremities seemed to be reduced about 50 per cent. as compared with that of another lad of the same size, and the right hand and leg were weaker than the left, though the lad was naturally right-handed. All tendon-jerks were greatly reduced, and the knee-jerks could not be obtained even by reinforcement. Cutaneous sensation and sphincteric control were normal. There was a slight tendency to lateral nystagmus when the eyes were directed strongly to the right or to the left, and the boy admitted that he had at times seen double. Pupils normal, slight inability to converge. The ophthalmoscope showed a slight blurring of the margins of the disk. No tenderness or localized elevation of the temperature over the cranium. The percussion note was practically the same on both sides. Hearing normal, smell and taste normal, tongue clean, physical functions well performed.

Under iodide of sodium, during the next three months, the boy made considerable improvement in his gait, was brighter, had but one or two slight convulsions, the vomiting subsided, and the headaches were much better. The knee-jerks reappeared. X-ray photographs made in April, 1898, gave the results shown in the accompanying cuts. On account of the improvement and the unfavorable location of the tumor, the idea of operation was not entertained.

In November, 1898, examination showed the following conditions: Pupils present a tendency to dilate, but respond promptly to light and accommodation; knee-jerks slightly exaggerated, but diminished upon attempts at reinforcement, equal on both sides; muscular power symmetrical and normal. Station fairly firm, but walking and standing with eyes closed very difficult; sudden turning to the right or the left induces a staggering, cerebellar gait, which is also manifest to a less degree in walking with open eyes. General sensation and special senses normal. Complains of a feeling of weakness in the legs, and has been having slight convulsions about once a month. These,

according to the observation of internes and nurses, are general in character. At times he complains of a slight frontal headache, usually upon waking in the morning. No apparent change in the eye-grounds.

On November 28th, after a day of headache, a severe convulsion occurred and the patient suddenly died.

For the following post-mortem notes I am indebted to Dr. F. X. Walls, pathologist to St. Luke's Hospital:

The bones of the cranial vault are very thin, averaging perhaps 4 mm. in thinnest portion, and are unusually translucent. Meninges and venous sinuses negative. Brain substance very tense.

In the posterior fossa of the skull was found a tumor of the right cerebellar hemisphere, about the size of a lemon, occupying the superior and anterior surface of the right hemisphere and tensely bulging in all directions, more especially forward and upward. The anterior part of the tumor was free from cerebellar substance, and was covered with a very thin layer of plastic lymph, which exudate extended downward and toward the median line, matting the tissues in the region of the foramen of Magendie. The remainder of the tumor was buried in the substance of the right cerebellum.

On sectioning the tumor its centre was found to contain about an ounce of clear fluid that was slightly blood-stained. Surrounding this central cavity the tumor-tissue was deeply infiltrated with blood that evidently was a recent hemorrhage. The rest of the tumor was of solid consistency and had the characteristic gelatinous appearance so suggestive of glioma, and especially marked was the infiltration of the tumor-tissue into the cerebellar substance at the periphery of the growth, so that a distinct line of demarcation between the neoplasm and the normal tissue was not to be made out in the fresh specimen.

The lateral ventricles were dilated and distended with over a litre of clear fluid, which would readily be explained from a consideration of the size and location of the tumor.

The other organs showed subserous punctate ecchymoses and visceral congestion, such as occur in death during convulsion.

Histologically, the study of the tumor has not been completed, but, from a consideration of a teased specimen in which branched neuroglia cells can be demonstrated, we can affirm that the tumor is a glioma. A specimen stained in hæmatoxylin and eosin shows a cellular tumor with abundant small nuclei, mostly round or oval, surrounded by a granular protoplasm; the branching of the cells is not to be made out, but this we hope to be able to demonstrate later by special staining methods.

The bloodvessels through the periphery of the growth are not numerous, but their walls are slightly thickened, while toward the centre of the tumor the bloodvessels are unusually numerous, have very thin walls, and are very much dilated with red blood-cells, giving in places the appearance of a cavernous hemangioma.

The tissue lining the central cavity is much denser than the rest of the neoplasm, fewer cells are present, and the tumor here has a wavy, homogeneous, colloidal appearance. In this tissue are areas of recent hemorrhagic infiltration and also dense masses of blood-pigment, the vestiges of ancient hemorrhages.

CARCINOMA OF THE PANCREAS.

EXPLORATORY OPERATION; STUDY OF THE FAT ABSORPTION.

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Clinical History by Dr. Northrup.

There are two features of especial interest in this case, viz., the diagnosis of the character of the disease and the location of the lesion in the head of the pancreas. The history is as follows:

The patient's father died of "cancer of the throat." His personal history is that of an exceptionally healthy, robust, enduring man of large physique, ruddy; in short, a man having all the physical features of an ideal coachman. A better glimpse of his regular life, temperance, and habits cannot be given than to state the fact that from early manhood to the time of his death he had never been out of employment, and had been coachman in all that time to but three families, two of them being Governors-General of Canada, the third a United States Senator.

The patient was forty-six years old and married. When first taken sick he weighed 220 pounds. His first symptom was pain in the back. Exposure while sitting upon the box in bad weather was set down as the cause of his illness, and he was allowed to send the second coachman when the weather was unfavorable. The rheumatism of the back grew no better, but he again forced himself to do full duty as driver. The pain at length grew so much worse that he could not endure long waits, and sought professional advice for the increasing rheumatism of the back. The first course of treatment given him was potassium iodide in increasing doses, with the application of the cautery along the skin of the dorso-lumbar region. This afforded temporary relief, but soon it became evident that the pains were growing more unbearable and interfered with sleep. They seemed worse at night. After a short sleep in the evening and early night the pains were such that he was obliged to sit up, taking "cat naps," as he expressed it.

In May, five months after his first pains, the patient entered the hospital for a week to allow study of his case, to the end that a diagnosis might be made. At that time it appeared that his bowels were somewhat inclined to constipation, that he experienced flatulence, eructations, and occasional vomiting an hour after eating. It also appeared that he had lost about forty pounds. This he attributed to the disturbance of his stomach due to taking so much medicine (potassium?), to loss of appetite and loss of sleep. His maximum weight had been 220 pounds, and his theory of the cause of loss was thought reasonable. Lavage relieved the eructations, but the pain continued, as did insomnia. A test-meal followed by Günzberg's test showed a good reaction—free hydrochloric

acid. The urine was normal, and physical examination revealed nothing ahnormal.

No diagnosis was recorded, but it is fair to the observers of this case to state that during this visit to the hospital the conjecture was expressed that this man would continue to lose flesh and would reappear with cancer of the stomach.

After leaving the hospital he was to continue daily lavage. For a time he had success in self-treatment—no more vomiting, only occasional lumbar pains, and persistent insomnia.

After another month, six months or more from the appearance of the first pains in the back, diarrhœa began—five or six loose movements daily —which continued to the end of life.

In the tenth month of illness (from first pains) he returned to the hospital, having lost seventy pounds, his complexion bearing the stamp of cachexia. Günzberg's test showed a faint reaction. Nothing could be felt in the epigastrium, though the abdominal walls were relaxed and depressed. Under chloroform a tumor was at once felt. It was just above the umbilicus, almost in the middle line, perhaps a little to the right, slightly movable—*i. e.*, it could be dragged a little to the right, so that the aorta could be felt pulsating at its left. The tumor did not move with respiration; was believed to be not connected with the greater curvature of the stomach, but distinctly coinciding in position with the head of the pancreas. As felt through the relaxed abdominal wall, it seemed like a cricket-ball—*i. e.*, round, sharply circumscribed, elongated.

The diagnosis of carcinoma of the head of the pancreas was made, and the patient transferred to the surgical division for exploratory operation. It may here be stated that the number and character of the passages of the patient (five to six loose motions daily) recalled to the mind of the writer some observations long since heard, that the diagnosis of pancreatic disease is sometimes aided by studying the stools. One observer claimed to have found fat floating on the stools, etc. With this thought in mind, without knowing whence it came, whether from reliable English observers (to the best of recollection) or from most unreliable sources, a systematic observation of the passages was instituted. The nurses reported that the passages were quite unusual in appearance, being gray stone-color, soft, pasty, and that accompanying them was a brownish watery fluid, like water with a little molasses dissolved in it, or like thin, brownish machine oil. Upon the surface was thought to be an oily film. These appearances varied but little, though occasionally a pulpy emulsified appearance was described. Whatever value these points should subsequently reveal, the diagnosis accompanying the patient to his operation was carcinoma involving the head of the pancreas and occluding the duct.

The reasons for considering (1) the lesion cancer were cachexia and emaciation (loss of weight, seventy pounds); and (2) the lesion not of gastric origin, were the presence of free hydrochloric acid in the gastric contents, also the further fact that the tumor did not feel freely movable; and (3) for considering the tumor a pancreatic involvement, the fact of its location, that the mass was scarcely movable, swaying a little to the right, not moving with respiration; that the soft, pasty, gray diarrhœal passages seemed to contain an excess of fat.

Exploratory operation was performed by Dr. McCosh, who described the findings as follows: A mass shaped like a very thick "pancake,"

involving the head or middle portion of the pancreas, including so many vessels that removal was out of the question.

The patient was returned to the medical division, when his wound had healed, for study of the fat absorption. He continued to have passages of the same appearance as before, three to five daily.

At this point we were fortunate in interesting Dr. C. A. Herter in the case, and securing his services in a careful study of the total intake and outgo of fats.

About one year from his first described pains in the back our patient was transferred to his home, an hour by train. He rapidly failed, and a month later died. Every effort to secure an autopsy failed, and the question whether the tumor occluded the pancreatic duct alone, or occluded both the pancreatic and biliary ducts, will never be answered.[1] By so much it falls short of being a classical case. The complete history of the case, then, accentuates the "second feature of especial interest in this case, viz., the locating of the disease in the head of the pancreas."

Chemical Examination of Feces and Urine by Dr. Herter.

The appearance of the stools from the patient who presented the foregoing history, having been such as to indicate the presence of a more than usual quantity of fat, it was thought desirable to make a study of the fat absorption in his case, in the hope that it might throw some light upon the relation of the retroperitoneal tumor (which was discovered under chloroform and subsequently verified by operation) to the patency of the pancreatic and biliary ducts. The chief object of the investigation was to determine how large a proportion of the fat introduced with the food was absorbed from the gastro-enteric tract, and how large a proportion was lost with the feces, it being known that the absorption of fats is apt to be greatly reduced when the pancreas is the seat of extensive disease, or when the pancreatic duct is impervious, or when the bile ducts are obstructed. The period of observation extended over seven days. During this time the patient was upon an exclusive milk diet. An accurate record was kept of the quantity of milk taken each day. A representative portion of each day's milk was set aside for the determination of the fat-content. The following table shows the facts relating to the quantity of milk and fat received daily:

Date.	Grammes of milk ingested.	Per cent. of fat, *i. e.*, ethereal extract.	Grammes of fat ingested daily.
October 29	2580	4.25	109.1
" 30	2850	3.49	90.0
" 31	2640	5.30	139.9
November 1	2640	4.45	117.5
" 2	3120	5.23	163.2
" 3	3240	4.41 (estimated)	142.9
" 4	3240	3.74	121.2
Total milk	20,040	Average 4.41	Total fat 883.8

[1] It is of interest that about ten weeks after the date of this study the patient developed intense jaundice, which lasted until his death, one week later. The appearance of jaundice probably corresponds to the implication of the common bile duct by the neoplasm.

It is thus seen that the patient received 883.8 grammes of fat in the seven days of the experiment, or 126.3 grammes daily—a generous but not extreme daily allowance of fat.

During a period corresponding to the seven days in which the fat-content of the milk was determined, the total quantity of feces was saved, with a view to ascertaining, first, the quantity of fat lost by the feces during the seven-day period, and, second, the relative proportion of neutral fats, fatty acids, and soaps. Owing to an oversight, an exact separation (by charcoal) of the feces corresponding to seven-day period was not effected. The period during which the feces were saved began and ended just twenty four hours later than the period during which the food was studied. An error is thus introduced, but it is probably very small, as the diet of the patient previous to the time of the study had for some time been essentially the same as that of the seven-day period. In order to prevent the action of micro-organisms in further splitting the neutral fat into fatty acids and glycerin, the feces were placed in a saturated solution of bichloride of mercury immediately after they were passed. As first passed the feces were typical acholic movements, light gray in color, and of the consistence of a soft pomade. Microscopical examination showed numerous fatty acid crystals. The epithelial detritus was not bile-stained. The feces were studied chemically, not in one portion from the entire week's collection, but in three separate portions. The percentage results given here represent averages obtained from the three portions. The total ethereal extract of the feces for the seven days was 335.36 grammes. The total ethereal extract from the milk taken during the period was, as above stated, 883.8 grammes. The fats soluble in ether which were lost by the feces thus amount to 37.95 per cent. of the fats introduced with the milk.[1] The ethereal extract of the feces does not, however, represent the total fat of the feces. The neutral fat of the feces and its fatty acids are extracted by ether, but the soaps do not enter into solution. It was, therefore, necessary to determine the fat present in the form of soaps in the residue of the feces (after extraction by ether). This was done by decomposing the soaps, liberating their fatty acids and extracting these by means of ether. A not inconsiderable quantity of fat was recovered in this way. Thus, the total fats of the feces, including fatty acids, neutral fats, and soaps, amounted to 415.11 grammes. This is equivalent to 46.76 per cent. of the fat ingested as milk. This loss of fat in the feces is greatly in excess of that which normally occurs. Thus, Mueller[2] in three healthy

[1] The ethereal extract of the feces constituted 49.98 per cent. (or three portions) of the dry substance of the feces. The following percentages of fat were obtained from normal feces from different individuals: 19.98, 26.39, 11.55, 17.90, 19.95, 12.58, 13.78, 21.39, 15 32, 14.17, 16.66, and 26.55 per cent.

[2] Untersuchungen über Icterus, Zeitschrift für klinische Medicin, Bd. 12, 1887, p. 45. This is probably the most important work on fat absorption hitherto published.

adult individuals found that the percentage of fat lost by the feces was 7.2 per cent., 16.9 per cent., 10.5 per cent. Of the known causes of a largely excessive loss of fat by the feces—*i. e.*, of defective fat absorption—there are two which may be excluded in this case: First, the excessive ingestion of fat, and, second, the presence of diarrhœa.[1] There are, however, two other causes of markedly reduced fat absorption which have to be considered carefully in reference to our patient—the absence of the pancreatic juice and the absence of the bile. In his study of the feces in jaundice, Mueller found that where the bile was wholly absent from the intestine the proportion of ingested fat that reappeared with the feces varied from 55.2 to 78.5 per cent. In several of Mueller's cases it was learned by autopsy that the bile was shut off from the duodenum owing to mechanical conditions, while in the same cases the pancreas was normal in appearance and its duct pervious. These cases constitute proof that the absence of bile may be the cause of greatly decreased fat absorption. This conclusion is in perfect accord with the experimental observation of Munk, who found in dogs with biliary fistula that the fat absorption was much reduced. Whether there are ever any exceptions to this influence of the bile on fat absorption we have yet to learn.

The influence of the pancreatic juice on the absorption of fats is less well understood and observations are more conflicting. Walker found that the stools were clay-colored or stone-colored and fatty in two cases of diabetes in which there was no jaundice, and in which autopsy showed disease of the pancreas, but no alterations in the liver. The stools were not studied chemically in these cases. In support of the view that fat stools may result from absence of the pancreatic juice is the evidence derived from the extirpation experiments of Abelmann,[2] of Minkowski,[3] and especially of Harley.[4] These observers found a marked reduction in fat absorption after extirpation of the pancreas. Harley obtained the striking result that the fat lost by the feces equalled or even exceeded that introduced when the pancreas had been removed from dogs.[5] In opposition to these findings are those obtained by Hartsen and by Mueller. Hartsen,[6] in two diabetics with extreme atrophy of the pancreas, found no increase in the fat of the stools, though from eight to ten spoonfuls of cod-liver oil were part of the day's food. Mueller could observe no distinct increase in the fat lost by the stools in

[1] In a patient suffering from acute intestinal indigestion, with repeated large pale movements, I found that the feces contained 53.91 per cent. of ethereal extract on one occasion, and 56.43 per cent. on another. The fat content returned to normal after three days.

[2] Inaug. Dissert. Dorpat, 1890.

[3] Zur Lehre von der Fettresorption, Berlin. klin. Woch., 1890, p. 333.

[4] The Journal of Physiology, vol. xviii., 1895.

[5] The excess of fat is attributed to the presence of fat in degenerated epithelium from the gut.

[6] Quoted by Nothnagel, Erkrankungen des Darms, 1895, p. 21.

two cases of pancreatic disease (one of advanced atrophy of the pancreas, another of cystic degeneration), though the food contained a usual quantity of fat. There are also numerous experimental results in opposition to those obtained, as mentioned above, by Abelmann, Minkowski, and Harley. Whatever conclusions may ultimately be reached as the result of new observations upon the relation between the pancreatic juice and fat absorption, it seems clear that extensive pancreatic disease does not *necessarily* interfere with the absorption of fat. So far, therefore, as our case is concerned, we cannot feel sure that the reduced fat absorption is due exclusively to disease of the pancreas, although we know from the exploratory laparotomy that the head of the pancreas was extensively diseased. We are unable to say whether the defective fat absorption depends on shutting out of the pancreatic juice alone or on the absence of both bile and pancreatic juice.

The careful studies of Mueller indicate that the pancreatic juice possesses the power of splitting the higher neutral fats into glycerin and the corresponding fatty acids. Neither the gastric juice nor the bile appears to possess this property. It was found by Mueller that in three cases of pancreatic disease the neutral fat in the stools was markedly increased—in one case it was 50.83 per cent., in another 52.3 per cent., and in a third 77.57 per cent. It seems probable that we may interpret habitual deficient fat-splitting as an indication that the pancreatic juice is deficient. In our own case the fat of the feces upon analysis yielded the following results:

	Second portion of feces.	Third portion of feces.	Average of three portions of feces.
Neutral fat . . .	17.87 per ct.	20.53 per ct.	17.50 per ct.
Fatty acids . . .	64.73 "	62.12 "	64.92 "
Soaps	17.70 "	17.35 "	17.58 "

In the three normal patients previously mentioned the neutral fats amounted to 27.88, 20.5, and 24.8 per cent. of the total fat of the feces. I have obtained similar percentages in a number of stools from normal persons.

It is thus evident that the breaking up of the neutral fats was accomplished as fully as in health. How is this to be explained on the assumption that the pancreas is the seat of extensive disease? Although we know that exclusion of the pancreatic juice from the intestine *may* occasion diminished splitting of neutral fat, there is no doubt that the breaking up of neutral fat into fatty acids and glycerin may be brought about to a considerable degree by the activity of micro-organisms. Thus, Escherich found in infants that the colon bacillus is capable of exerting such an action. In our case we have positive evidence that the bacterial activity of the intestine was more pronounced than is usual in health. Thus, it was found that the ethereal sulphates of the urine, which constitute a rough index of the extent of putrefaction of proteid substances

in the intestine, were considerably increased. On October 30th the ethereal sulphates amounted to 0.484 gramme. The proportion of the ethereal or combined sulphates to the preformed sulphates on this day was 1 : 5.19. In health, on a milk diet the quantity of the ethereal sulphates in the twenty-four hours' urine from a man of average weight is generally less than 0.250 gramme. The proportion of the ethereal to the preformed sulphates (which is a more reliable index than the absolute quantity) varies from 1 : 15 to 1 : 25 on a milk diet. Again, in our case the indigo-blue of the urine, as tested by Obermeyer's solution, gave an exceptionally strong reaction on October 30th, such as is never seen in health and seldom in disease. The quantity of the indoxyl compound, the oxidation of which is the cause of the indigo-blue reaction, was shown to be unusually great in the urine collected during three of the seven days. The phenol contained in a twenty-four hours' urine amounted to 0.083 grammes. This is considerably in excess of what should be found in a patient on a milk diet, and is another indication of excessive putrefaction in the intestine. These observations collectively can only be interpreted as showing that for some reason the putrefaction of proteids in the intestine was excessive. We know through the increased indigo-blue yielded by the urine that the production of indol was excessive in our patient's intestine. I believe I have demonstrated that the chief cause of the indol production in the intestine is the activity of the common colon bacillus.[1] If, as stated by Escherich, the colon bacillus is capable of splitting fats, we seem fully justified in regarding bacterial activity as a factor in the fat splitting in the case of our patient, and it is probable that this influence is capable of fully compensating any deficiency in the fat-splitting ferment of the pancreatic juice.

It has been claimed by Pisenti,[2] that one of the consequences of shutting out the pancreatic juice from the intestine is the diminution of that proteolysis which leads ultimately to production of indol as well as other aromatic products, and to a consequent reduction of the indican of the urine. It is, however, now well understood that indol is one of the products of proteid putrefaction under the activity of the colon bacillus, and the strong indican reaction observed in the urine of our patient cannot be interpreted as inconsistent with the view that the pancreatic juice does not reach the gut.

One other feature of the feces of our patient calls for comment—the apparent absence of coloring matter. The absence of the color indicative of transformed bile pigment has usually been regarded as evidence

[1] On Certain Relations between Bacterial Activity in the Intestine and the Indican of the Urine. British Medical Journal, October, 1897.

[2] Ueber den Zusammenhang zwischen der Einwirkung des Pancreas auf die Eiweisskŭken und die Indicanmenge in Urine. Arch. per le Scienze med., 1887, vol. xii., No. 5.

that the bile has not entered the duodenum. Walker,[1] however, claims that light or stone-colored stools may arise as the result of pancreatic disease when the liver ducts are not implicated, and mentions two cases which seem to support the view that the pancreatic juice is as essential to the yellow or brown color of the stools as is the bile. We can hardly regard as settled the significance of stools which apparently contain no yellow or brown pigment, and it is somewhat surprising that so few accurate observations exist with reference to so important a subject. It is, however, clear, in the light of Walker's observations, that we are not safe in concluding that the bile is shut off from the duodenum simply because the stools are apparently acholic.[2]

To sum up, the study of our patient while on a milk diet shows (1) that a decidedly excessive quantity of the ingested fat was lost with the feces; in other words, that fat absorption was distinctly impaired; (2) that the fat-splitting process was accomplished as fully as in health, and (3) that the putrefaction of proteids in the intestine was excessive. The persistence of these conditions in themselves constitutes evidence that either the pancreatic juice or the bile, or both, were wholly or partially excluded from the intestine. An exploratory laparotomy showed that the pancreas was the seat of malignant disease. Therefore we may regard the condition mentioned as due to pancreatic disease rather than to disease of the liver or bile ducts, but we have no proof that the bile ducts were not also implicated, and that the bile as well as the pancreatic juice was deficient in the intestine. The fact that there was no glycosuria is not inconsistent with extreme pancreatic disease, nor was the presence of a large amount of indican in the urine. It is possible that an autopsy would have thrown additional light on the cause of the deficient fat absorption, but it must be remembered that the conditions as regards the patency of the pancreatic and bile ducts might be quickly altered by a rapidly growing neoplasm.

[1] On the Clinical Significance of Colorless or Clay-colored Stools Unaccompanied by Jaundice, etc. Medico-Chirurgical Transactions, London, 1889, vol. lxxii. p 257.

[2] Quincke, in an instructive paper (Münchener med. Wochenschrift, 1896, p. 854) calls attention to the fact that gray-colored stools, apparently acholic, may persist for weeks, urobilin being in reality present, as can be shown by extracting the feces with acidulated alcohol. The evidence favors the view that the feces sometimes contain a chromogen derived from hydrobilirubin, which is coexistent with an acholic appearance of the stools. Unfortunately, there are as yet no observations on the fat-content of the stools under these conditions.

ON THE PRESENCE OF NEUSSER'S PERINUCLEAR BASOPHILIC GRANULES IN THE BLOOD,

AND THEIR RELATION TO THE ELIMINATION OF THE ALLOXURIC BODIES IN THE URINE.

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The observation, originally made by Neusser,[1] that under certain conditions granules may be found in the blood, which manifest a marked affinity for basic dyes and are located in immediate contact with the nuclei of leucocytes, has received comparatively little attention. This is the more surprising in view of Neusser's claim that these granules are essentially found in patients the subjects of the uric-acid diathesis, and may be regarded as pathognomonic of the disease in the widest sense of the term, viz., including gout, lithiasis, muscular rheumatism, nervous asthma, skin affections, gastro-intestinal derangements, diabetes, leucæmia, neuralgia, and neurasthenia. The only exception to this rule was noted in certain tubercular subjects, in which the granules were at times found, and which Neusser believed pursued a more favorable course than those in which the granules were absent.

Kolisch, a pupil of Neusser's, likewise regards these granules as evidence of the uric-acid diathesis.[2] But, while Neusser believes the diathesis in question to be associated with an increased elimination of uric-acid, Kolisch finds the uric acid relatively diminished, but the xanthin-bases actually increased to such an extent that the alloxuric bodies as a whole are eliminated in increased amount.

The text-books on clinical diagnosis which have since appeared make little mention of the subject. v. Jaksch[3] thus merely states that further observations will show to what extent Neusser's basophilic granules are of diagnostic interest. Cabot[4] likewise brings nothing new. The only other observations upon the subject which I have been able to find recorded in the literature come from Futcher and Fisch, in this country.

Futcher's results, however, in no way bear out the correctness of Neusser's view, and he concludes his most valuable report as follows: These observations do not in any way confirm the theory that there is a regular coincidence between an abundance of the granules and an increased excretion of the alloxuric bodies, nor do they favor the view that Neusser's granules occur exclusively in patients with an alloxuric diathesis. Cases occur in which, with numerous granules in the leuco-

[1] Neusser. Wiener klin. Wochen., 1894, vii. p. 71.
[2] Kolisch. Ibid., 1895, viii. p. 797.
[3] Clinical Diagnosis. Fourth edition.
[4] Clinical Examination of the Blood. Wm. Wood & Co., New York, 1897.

cytes, there is a relatively small amount of the alloxuric bodies eliminated in the urine, while, on the other hand, the granules may be almost entirely absent, and the alloxuric bodies be excreted in increased amount. Such directly opposed conditions may occur in different individuals having the same disease. Not infrequently the granules become increased or diminished in the same person without there being a corresponding increase or diminution in the excretion of the alloxuric bodies. In fact, increase in the number of granules may be accompanied by a diminution of the alloxuric bodies, and *vice versa*. From the information obtained one seems justified in concluding that the supposed relationship between the perinuclear basophilic granules and an alloxuric diathesis, as claimed by Kolisch, is purely empirical.[1] Fisch,[2] on the other hand, claims that in the overwhelming majority of all blood specimens examined not a trace of these bodies can be found. He believes that this fact cannot be too strongly accentuated in order to show that they are certainly something abnormal. From the experiments dealing with four persons (and from other scattered observations), he is of opinion that really abundant perinuclear granule-formation corresponds to an increased uric-acid elimination.

In view of the importance of the subject, and the scarcity of observations thus far recorded, it seemed necessary to repeat the work done already, and, if possible, to account for the widely divergent results obtained.

The questions which naturally suggested themselves for investigation were the following:

1. Are Neusser's granules found in the human blood under strictly normal conditions?

2. In diseased conditions, are these granules confined to the blood of patients suffering from the uric-acid diathesis?

3. Does a constant relation exist between the presence of these granules in the blood and the elimination of uric acid, xanthin-bases, or both?

Incidentally, it seemed of interest to ascertain to what extent an increased elimination of uric acid, as such, and of the alloxuric bodies as a whole, plays a part in the symptomatology of the uric-acid diathesis.

For practical purposes it was not deemed essential to place the persons to be examined in a condition of nitrogenous equilibrium, and, as a general rule, but one examination both of the blood and urine was made. The blood specimens were obtained within the same twenty-four hours as the urine. The uric acid was estimated according to Hopkins' method as modified by Whitney.[3]

One hundred c.c. of urine are treated with 30 grms. of finely-powdered

[1] Futcher. Bulletin of the Johns Hopkins Hospital, May, 1897.
[2] Fisch. St. Louis Medical Gazette, 1898, vol. I. p 10.
[3] Whitney. Maryland Medical Journal, 1898, vol. xxxviii. p. 334.

and chemically pure ammonium chloride. The mixture is thoroughly shaken and set aside for from two to three hours, care being taken to stir it from time to time. It is then passed through a small filter with the aid of mild suction, and the precipitate washed two or three times with a saturated solution of ammonium chloride. With a little boiling water the salt is washed from the filter, and decomposed with 10 c.c. of a decinormal solution of hydrochloric acid. The solution is brought to the boiling-point and the excess of hydrochloric acid not used in the decomposition of the ammonium biurate retitrated with a decinormal solution of sodium hydrate, using a half per cent. alcoholic solution of dimethyl-amido-azo-benzol as an indicator. This excess is deducted from the original ten cubic centimetres. The result, multiplied by 0.0168, will indicate the amount of uric acid contained in 100 c.c. of urine.

The xanthin-bases were estimated according to the method of Krüger-Wulff, as described in my *Clinical Diagnosis*.[1]

The blood was drawn from the finger, spread between cover-glasses, dried, fixed in absolute alcohol, stained with Neusser's modification of Ehrlich's tri-acid stain, mounted in oil of cedar, and examined with a 1-12 oil immersion lens. The stain was prepared according to Neusser's directions, and contained

Saturated aqueous solution of acid fuchsin . . .	50 c.c.
Saturated aqueous solution of orange G.	70 "
Saturated aqueous solution of methyl-green . . .	80 "
Distilled water	150 "
Absolute alcohol	80 "
Glycerin	20 "

Prepared in this manner the specific granules appear as greenish-black or entirely black little dots, which are irregularly scattered over the surface of the nucleus, as though they had been pressed out from its substance. In size they vary considerably. Specimens are thus encountered in which the granules are as fine as an ordinary neutrophilic granule, while others are much larger, and in some cases droplets may even be seen which nearly cover the entire nucleus. By a massing together of the granules, moreover, curious figures are at times formed, and it is very common to see specimens in which they form a distinct ring or star on the surface of the nucleus. Their number is likewise subject to considerable variation, some nuclei carrying only a single granule, while on others as many as twenty or even more may be counted.

[1] This method was used by preference in order to permit of a direct comparison of my results with those obtained by Neusser, Kolisch, and Futcher. At the same time I believe, with Malfatti, that the objections made to this method by Huppert, Salkowski, and others are not altogether valid, as the precipitation of other nitrogenous constituents by sodium sulphite and copper sulphate would scarcely affect the results reached, providing that the precipitate has been thoroughly washed. It has, moreover, not been satisfactorily proved, as yet, that the xanthin-bases are completely thrown down by the silver method, and it is not at all improbable that certain xanthins may form insoluble salts with copper, and not with silver.

Contrary to Neusser's experience, I have found these granules most abundant in the polymorphonuclear elements, although they are very nearly as numerous in the small mononuclear forms. The percentage number of the latter showing granules was 86.5; that of the large mononuclear leucocytes, 40.5; of the transition forms and polymorphonuclear elements, 91.5; and of the eosinophilic leucocytes, 39.4. The largest, average, and smallest number counted in these various forms is seen below:

	Largest Number.	Average Number.	Smallest Number.
Small mononuclear leucocytes . . .	25	4.3	0
Large mononuclear leucocytes . . .	8	1.3	0
Transition forms and polymorphonuclear leucocytes	20	6.3	0
Eosinophilic leucocytes	5	1.5	0

In the first series of fifty cases, which Dr. S. P. Latané examined in my laboratory, the granules, present in every leucocyte on the coverslip, were counted. In the subsequent cases, however, this attempt was abolished, and the granules were either recorded as absent, or present in very small, small, moderate, large, or excessive numbers, a single glance at each leucocyte being sufficient to place it in its proper category.

In order to ascertain whether or not Neusser's granules ever occur in the blood under strictly normal conditions, special precautions were taken in the selection of the subjects for examination. Only such were taken in which a negative family history as regards gout, rheumatism, lithiasis, and neurasthenia could be obtained, and in which the uric-acid coefficient was larger than one to thirty. In every case thus examined, without exception, the specific granules were found, so that the question, Do Neusser's granules occur in the blood under strictly normal conditions? can be definitely answered in the positive. My results are thus in direct accord with those reached by Futcher, who, "in a very large number of cases examined, both in healthy and diseased persons, never failed to find the granules present." So constant, indeed, is the presence of these granules in health that I feel justified in stating that their *absence* in a supposedly healthy individual may be regarded as presumptive evidence of some morbid process.

To determine the second point—*i. e.*, whether or not in diseased conditions Neusser's granules are to be found only in persons the subjects of the uric-acid diathesis—the blood of every patient occurring in my practice during the past winter was examined in this direction. It was thus found that the granules are almost as constantly present in diseased conditions as in health, and that they are not necessarily more abundant in cases of gout, lithiasis, chronic rheumatism, and neurasthenia than in other conditions. My observations are thus again in accord with those of Futcher, who says: I was able to convince myself that

the granules were not more marked in the blood of patients suffering from the so-called uratic diathesis than in other diseases, or even in apparently healthy individuals.

During this series of investigations the interesting fact developed, however, that whereas under normal conditions Neusser's granules are constantly met with in the blood, they may at times be absent in disease, or present in such small numbers as to attract attention. The first cases in which this observation was made were patients with malignant disease, and it occurred to me that possibly the absence of Neusser's granules might be important from the stand-point of differential diagnosis. In this belief I was encouraged through similar observations made by Drs. G. W. Johnston and A. Stewart, of Washington, who reported that in eleven cases of malignant disease, including sarcoma of the kidney and neck, carcinoma of the uterus, stomach, rectum, œsophagus, liver, etc., no perinuclear granules were found in ten. They further state that carefully conducted experiments excluded all probable causes of error, and that the diagnosis in each case was verified by operation or the subsequent history and termination. The eleventh case, in which no perinuclear granules were discoverable, was a negress (all the rest were whites). Here a clinical diagnosis of inoperable malignant disease of the uterus was made, but the patient was lost sight of and her fate is unknown.[1]

Continued investigations, however, taught me that, whereas the granules are quite constantly absent in malignant disease, this may also occur under other pathological conditions, and I have recently observed two cases of gastric ulcer and one case of acute gonorrhœa in which the granules were likewise not to be found. Their absence is thus in no way pathognomonic of malignant disease, but the constancy with which they are missed under such conditions appears to me sufficiently important to merit attention and further investigation.

As far as the occurrence of the granules in tubercular subjects goes, I have not been able to verify Neusser's claim, though I admit that my tubercular material is small. But Futcher also says that in tuberculosis he has observed cases with abundant granules and others with few granules, without having noticed any difference in the subsequent course of the disease.

The third series of experiments was undertaken to ascertain whether or not a constant relation exists between the presence of the granules and the elimination of uric acid, xanthin-bases, or both. To this end a systematic examination of both blood and urine was made in fifty cases, many of which presented marked symptoms of the uric-acid diathesis.

A brief record of these cases follows, and the results obtained are tabulated in Table I.

[1] The National Medical Review 1898, vol. viii. p. 78.

TABLE I.

No.	Amount.	Density.	Reaction.	Albumin.	Sugar.	Uric acid.	Urea.	Xanthins.	Alloxuric bodies.	Small mononuclear leucocytes.			Large mononuclear leucocytes.			Transition forms and polymorphonuclear leucocytes.			Eosinophilic leucocytes.		
										a	*b*	*c*	*a*	*b*	*c*	*a*	*b*	*c*	*a*	*b*	*c*
	c.c.									pr.ct.			pr.ct.			pr.ct.			pr.ct.		
1	1020	1.015	Acid	Trace	None	0.2785	19.38	0.4306	0.7091	100	11	7	25	2	0.5	100	20	15	100	2	2
2	1200	1.009	"	"	"	0.66	12.0	0.044	0.704	80	12	8	40	2	1	80	15	8	50	3	½
3	830	1.019	"	None	"	0.1817	11.2	0.383	0.5647	100	8	3	32	8	3	100	10	6	50	2	1
4	1160	1.019	Neutral	"	"	0.8139	15.08	0.52	1.3389	69	9	4	0	0	0	66	12	3	0	0	0
5	1140	1.016	Acid	"	"	0.0399	15.96	0.0107	0.0506	100	7	5	20	4	0.5	92	11	4	50	3	1
6	940	1.026	"	"	"	0.2876	26.32	0.413	0.7096	100	9	7	5	3	1	100	15	11	50	2	1
7	1060	1.021	"	"	"	0.4695	23.32	0.692	1.1615	100	13	6	66	5	2	78	10	4	50	1	0.5
8	860	1.027	"	"	"	0.2336	21.50	1.0791	1.3127	100	6	4	57	2	1	100	15	10	...	...	...
9	720	1.027	"	"	"	0.6408	17.28	0.2234	0.8642	60	3	1	25	1	¼	85	6	3	0	0	0
10	1320	1.019	"	Trace	"	1.1523	18.48	0.0884	1.2407	70	4	1	60	1	1	94	8	4	0	0	0
11	1140	1.010	"	"	"	0.9348	18.24	.....	.....	80	11	5	25	2	¼	93	9	7	0	0	0
12	1420	1.022	"	"	"	0.7866	14.2	.....	.....	100	10	5	80	8	4	80	11	6	0	0	0
13	1230	1.016	"	None	"	0.5166	15.99	0.7083	1.2253	77	12	4	33	2	1	100	12	8	50	3	1
14	1130	1.020	"	"	"	.....	.....	.....	.....	66	8	3	50	8	2	82	8	2	0	0	0
15	1190	1.023	"	"	"	1.266	.....	.....	.....	72	8	3	57	4	1	98	7	3	100	2	1
16	860	1.022	"	"	"	1.144	.....	.....	.....	75	5	2	85	5	3	100	9	5	100	2	1
17	870	1.022	"	"	"	0.8744	.....	.....	.....	100	12	4	60	7	0.5	100	12	10	50	1	1
18	1510	1.016	"	1.5 p.m.	"	0.7097	14.73	.....	.....	80	9	4	42	4	2	80	8	7	50	2	1
19	2476	1.015	Alkaline	None	"	2.079	22.28	.....	.....	100	8	3	33	3	1	100	14	6	50	3	2
20	1510	1.016	Acid	"	"	1.9787	24.16	.....	.....	100	8	5	33	6	2	88	8	4	50	1	½
21	950	1.018	"	"	"	0.1436	12.35	0.6664	0.8100	75	8	4	25	8	1	100	10	4	50	1	1
22	1250	1.022	"	Trace	Trace	0.945	25.0	0.0983	1.0433	100	8	3	50	3	1	100	12	6	50	3	1
23	745	1.021	"	"	None	0.7384	17.88	0.2035	0.9419	...	...	...	...	...	...	...	...	...	...	...	...
24	970	1.019	"	None	"	0.4563	14.55	0.4642	0.9205	100	6	4	6	2	1	83	6	3	50	2	1
25	2330	1.012	"	"	"	0.2740	16.47	0.5719	0.8459	65	18	1	10	4	1	80	12	10	0	0	0
26	1000	1.027	"	"	"	0.6384	20.0	0.1330	0.7714	100	10	4	23	3	2	95	14	8	0	0	0
27	1899	1.013	"	Trace	"	0.7851	10.46	.....	.....	...	...	...	...	...	...	...	...	...	...	...	...
28	3210	1.022	Neutral	None	Present	0.9707	40.12	0.7887	1.7594	80	8	7	80	2	1	82	9	7	0	0	0
29	715	1.015	Acid	"	None	0.3482	10.01	0.1248	0.4730	75	4	5	55	4	2	100	15	4	50	3	1
30	1080	1.023	"	"	"	0.7620	20.08	0.1923	0.9543	60	10	2	30	8	3	100	8	3	100	2	1
31	1110	1.020	"	"	"	0.4662	19.42	0.3193	0.7855	100	9	6	32	6	½	100	9	2	100	2	0.5
32	1365	1.016	"	"	"	1.054	21.84	0.0997	1.1537	78	6	2	20	5	2	86	12	10	100	3	1
33	680	1.010	"	"	"	0.1999	3.06	0.1165	0.3164	63	15	4	76	8	2	90	7	5	50	2	1
34	420	1.022	"	"	"	0.3457	9.24	0.2127	0.5584	100	10	5	5	4	1	100	9	6	0	0	0
35	1140	1.020	"	Trace	"	1.52	14.82	.....	.....	...	...	...	...	...	..	...	...	...	...	...	...
36	1020	1.015	"	None	"	0.5829	15.31	0.0300	0.6129	100	8	3	30	3	2	100	5	2	100	2	1

37	680	1.021	Acid	Trace	None	0.6785	15.64	0.4327	1.1112	100	7	1	25	6	1	80	8	3	50	4	1
38	975	1.022	"	None	"	0.7527	19.01	.....	.....	...	...	...	...	...	...	...	...	...	...	...	...
39	1330	1.015	"	"	"	0.8044	16.62	0.5568	1.3095	100	10	6	16	1	1	100	15	6	50	3	1
40	1670	1.013	"	"	"	0.8416	16.7	0.2094	1.0510	80	14	2	24	3	2	85	10	4	0	0	0
41	2470	1.006	"	"	"	1.6178	13.58	.....	.....	...	...	..	...	...	...	...	...	...	...	...	...
42	710	1.027	"	"	"	0.5602	17.04	0.392	0.9522	75	4	1	54	2	½	65	8	4	0	0	0
43	1640	1.012	"	"	"	0.9643	17.22	.....	.....	82	12	6	32	5	½	100	12	7	100	2	1
44	1165	1.021	"	"	"	1.1545	22.72	.....	.....	100	8	4	27	4	2	100	12	5	100	2	1
45	2020	1.012	"	"	"	2.23	28.28	.....	.....	60	10	3	50	7	2	80	7	4	100	3	½
46	1000	1.010	"	"	"	0.3192	5.0	0.07	0.3829	62	6	2	52	4	1	65	15	10	50	2	1
47	4160	.....	"	Trace	235.9	0.4892	45.76	1.1598	1.6490	100	7	4	80	3	½	80	8	4	50	2	½
48	936	1.016	"	"	None	0.5653	20.59	0.5783	1.1436	80	16	8	6	3	2	75	8	8	50	3	½
49	760	1.027	"	None	"	2.2784	26.6	.....	.....	100	13	2	12	4	1	100	10	3	50	3	1
50	955	1.015	"	Trace	"	0.6060	15.6	0.2521	0.8581	75	4	2	50	5	2	100	9	6	50	2	1

a has reference to the percentage number showing granules; *b* indicates the maximum, and *c* the average number of granules in each leucocyte.

TABLE II.

No.	Diagnosis.	Urea.	Uric acid.	Uric-acid coeffi-cient.	Xanthin bases.	Alloxuric bodies.	Alloxuric coeffi-cient.	No.	Diagnosis.	Urea.	Uric acid.	Uric-acid coeffi-cient.	Xanthin bases.	Alloxuric bodies.	Alloxuric coeffi-cient.
1	Arterio-sclerosis	15.6	0.6060	1 : 25.7	0.2521	0.8581	1 : 18.1	14	Uric-acid diathesis	15.64	0.6785	1 : 11.6	0.4327	1.1112	1 : 14.0
2	Chronic gout	12.0	0.66	1 : 18.6	0.044	0.704	1 : 17.0	15	Migraine	16.7	0.8416	1 : 29.8	0.2094	1.0510	1 : 15.8
3	Chronic gout	11.2	0.1817	1 : 61.6	0.383	0.5647	1 : 19.7	16	Uric-acid diathesis	17.04	0.5602	1 : 30.4	0.392	0.9522	1 : 17.8
4	Uric-acid diathesis	21.5	0.2336	1 : 92.0	1.0791	1.3127	1 : 16.1	17	Chronic gout	17.22	0.9643	1 : 17.8			
5	Chronic gout	18.48	1.1523	1 : 16.0	0.0884	1.2407	1 : 14.8	18	Uric-acid diathesis	22.72	1.1545	1 : 19.6			
6	Chronic gout	15.99	0.5166	1 : 30.9	0.7083	1.2249	1 : 13.0	19	Migraine	19.42	0.4662	1 : 41.6	1.002	1.4682	1 : 15.2
7	Uric-acid diathesis	24.16	1.9787	1 : 12.2				20	Uric-acid diathesis	19.01	0.7527	1 : 25.2	0.2946	1.0473	1 : 18.1
8	Lithiasis	17.88	0.7384	1 : 24.2	0.2035	0.9419	1 : 18.9	21	Uric-acid diathesis	13.58	1.6178	1 : 8.3			
9	Migraine	20.0	0.6384	1 : 31.0	0.1330	0.7714	1 : 25.9	22	Lithiasis	5.0	0.3192	1 : 15.6	0.07	0.3892	1 : 12.8
10	Chronic gout	10.46	0.7851	1 : 13.3				23	Uric-acid diathesis	19.38	0.2785	1 : 69.5	0.4306	0.7091	1 : 27.3
11	Chronic gout	21.84	1.054	1 : 20.7	0.9897	1.1537	1 : 18.0	24	Lithiasis	20.59	0.5653	1 : 36.4	0.5783	1.1436	1 : 18.0
12	Migraine	3.06	0.1999	1 : 15.3	0.1165	0.3164	1 : 9.6	25	Uric-acid diathesis	26.6	2.2784	1 : 11.7			
13	Lithiasis	14.82	1.52	1 : 9.7											

CASE 1.—A. J., female, aged sixty-four years. Family history of rheumatism and gout. Seven years ago was paralyzed on right side. Arterio-sclerosis well marked. A great deal of mental depression.

CASE 2.—E. S., female, aged seventy-eight years. Gouty family history. Arterio-sclerosis.

CASE 3.—C. W. C., male, aged fifty-six years. Gouty family history. A great sufferer from gout for many years. Tophi. Arterio-sclerosis.

CASE 4.—E. O., male, aged thirty years. Gouty family history. Some uric-acid symptoms. Otherwise normal.

CASE 5.—M. B. W., female, aged sixty-eight years. Rheumatism and insanity in family. Pronounced neurasthenia. Arterio-sclerosis. Epithelioma of neck. Marked anæmia.

CASE 6.—E. M. S., male, aged forty-two years. Family history of gout. Chronic neurasthenia. Arterio-sclerosis.

CASE 7.—J. M. G., male, aged forty years. Marked history of chronic Bright's disease on both sides of family. Influenza.

CASE 8.—D. C., male, aged sixty-five years. Nothing in family history. Well-marked arterio-sclerosis. Typical uric-acid diathesis. Neurasthenia.

CASE 9.—J. W. S., female, aged forty-six years. Father died of heart disease. Climacteric hysteria.

CASE 10.—F. L., female, aged fifty-two years. Marked family history of gout. Chronic gout and neurasthenia. Lithiasis.

CASE 11.—M. W., female, aged twenty-three years. History of gout and Bright's disease on mother's side. Father has calculous pyelitis. Chlorosis and typhoid fever, second week; temperature 101° to 103° F.

CASE 12.—J. C. H., male, aged thirty-five years. Neurasthenia.

CASE 13.—V. E. E., female, aged sixty-five years. Rheumatism in family. Formerly suffered a great deal with migraine. Neurasthenia. Chronic gout. Tophi. Arterio-sclerosis.

CASE 14.—P. C., male, aged twenty-five years. Marked gouty history. Neurasthenia. Uric-acid diathesis.

CASE 15.—W. M. L., male, aged forty years. Septic infection.

CASE 16.—S. P. L., male, aged twenty-three years. Rheumatic family history. Lithiasis (?).

CASE 17.—L. S., female, aged thirty-two years. Nothing in family history. Mild chlorosis.

CASE 18.—F. L., male, aged forty-two years. Rheumatism and gout in family. Chronic Bright's disease, following acute nephritis.

CASE 19.—M. H., male, aged (?). Amputation of foot for railroad accident.

CASE 20.—T. H., male, aged fifty-eight years. Gouty ancestry. Arterio-sclerosis. Uric-acid diathesis. Neurasthenia.

CASE 21.—Miss P., aged about forty years. Uric-acid diathesis. Chronic neurasthenia.

CASE 22.—Mrs. B., aged sixty-six years. Father died of heart disease; mother suffered with migraine. Had migraine as a young woman. Myoma of the uterus. Four years ago was operated upon for carcinoma of the left breast. Local recurrence two months ago. Diabetes developed two years after operation. Marked obesity.

CASE 23.—Male, aged fifty years. Nothing in family history. Typical lithiasis and myelitis. For many years migraine.

CASE 24.—C. L. D., male, aged thirty-one years. Some rheumatism in family. Neurasthenia.

CASE 25.—C. E., male, aged twenty-six years. Neurasthenia.

CASE 26.—G. F. G., male, aged thirty-one years. Migraine on both father's and mother's side. Migraine during the last four years.

CASE 27.—Miss McC., aged about forty years. Gouty family history. Hysteria. Tophi.

CASE 28.—M. T., female, aged fifty-one years. Rheumatism and gout in family. Diabetes. Arterio-sclerosis. Tophi.

CASE 29.—C. N., female, aged thirty-six years. Father died of nephritis. Migraine since childhood. Severe neurasthenia. Weight, seventy-four pounds.

CASE 30.—J. M. F., male, aged thirty-six years. Uric-acid diathesis. Neurasthenia.

CASE 31.—E. B., female, aged twenty-seven years. Very marked family history of migraine. Migraine since fifteen years of age. Neurasthenia.

CASE 32.—Mrs. C., aged fifty-six years. Migraine in family. Migraine since childhood. Arterio-sclerosis.

CASE 33.—W. L. T., female, aged forty-five years. Migraine on both sides of family. Migraine since childhood. Beginning climacteric.

CASE 34.—Mrs. B., aged twenty-six years. Chlorosis and neurasthenia.

CASE 35.—Mrs. H., aged forty years. History of nephritis and lithiasis. Chronic gout. Tophi. Nephrolithiasis.

CASE 36.—Miss P., aged thirty years. Rheumatism in family. Neurasthenia.

CASE 37.—E. B. B., male, aged forty-seven years. Nothing in family history. Rheumatism at seventeen years of age. Marked uric-acid diathesis. Much mental depression.

CASE 38.—Mr. P., aged about fifty years. Uric-acid diathesis. Neurasthenia.

CASE 39.—A. P., male, aged thirty-two years. Neurotic family history. Pseudo-leucæmia.

CASE 40.—T. N. C., male, aged about thirty-eight years. Migraine in the family. Migraine since childhood. Some arterio-sclerosis.

CASE 41.—S. E. C., male, aged thirty-two years. Neurotic family history. Neurasthenia. Uric-acid diathesis.

CASE 42.—S. J. L., male, aged fifty-four years. Some rheumatism (gout?) in family. Nephrolithiasis.

CASE 43.—Mrs. G., aged about forty years. Nothing in family history. Chronic gout. Tophi.

CASE 44.—J. T. F., male, aged about fifty years. Nothing in family history. Uric-acid diathesis. Neurasthenia.

CASE 45.—M. F., female, aged thirty-eight years. Neurotic family history. Neurasthenia.

CASE 46.—J. A. L., male, aged sixty-three years. One brother died of heart disease. Nephroliathisasis. Arterial sclerosis. Heart disease.

CASE 47.—Mrs. T., aged about fifty-eight years. Rheumatism in family. Diabetes. Chronic gout.

CASE 48.—Mr. B., aged about fifty years. Migraine in family. Nephroliathiasis.

CASE 49.—Miss C., aged forty-two years. Chronic gout. Gouty ancestry. Marked neurasthenia.

CASE 50.—H. J., female, aged sixty years. Nothing special in family. Uric-acid diathesis. Arterio-sclerosis.

From an analysis of these cases it is at once apparent that a constant relation between the presence of the granules and the elimination of uric acid or xanthin-bases does not exist. For, while in a number of instances the granules were present in large numbers, coincidently with an increased elimination of uric acid or of the xanthin-bases, or both, there were others in which but few granules occurred with an increased elimination, or many granules with a diminished elimination, of the alloxuric bodies in the urine.

My personal observations on the occurrence of Neusser's granules in the blood are thus entirely in accord with those of Futcher, and in no way bear out the claims of Neusser and Kolisch.

Experiments undertaken with a view of reconciling the difference in the results reached by different observers have thus far been unsuccessful. Whether or not Ehrlich's view,[1] who regards Neusser's granules as artefacts, and states that they are only rarely observed when strictly pure solutions made up from the crystalline dyes are used, be correct, I am not prepared to say, but am rather inclined to doubt.

In the study of the final question, which suggested itself for investigation—*i. e.*, to what extent an increased elimination of uric acid, as such, and of the alloxuric bodies as a whole, plays a part in the symptomatology of the uric acid diathesis—some difficulty was experienced in the selection of the proper subjects. This was owing to the absence of a proper definition of just what is meant by the uric-acid diathesis. Gout and liathiasis, experience has shown to be associated in some manner with an abnormal metabolism, as the result of which some of the uric acid formed within the body, or introduced from without, is retained and deposited in the joints, along the tendons, in the pelvis of the kidney and the like, where it may or may not give rise to clinical symptoms. Such cases, of course, were directly accepted. But aside from these cases there are others in which no symptoms referable to local irritation are found, but in which, associated with certain nervous and digestive symptoms, such as depression of spirits, feelings of apprehension, moodiness, irritability, a want of self-reliance, and various subjective dyspeptic manifestations, we find a scanty, high-colored urine which, upon standing, deposits an abundant sediment of uric-acid crystals. This condition constitutes what is generally spoken of as lithæmia, or uric-acid diathesis in the more limited application of the term. Such cases were, hence, likewise included, as were also those of migraine and arterio-sclerosis in which distinct improvement followed a treatment directed toward an increased elimination and diminished

[1] Ehrlich and Lazarus. Die Anæmie. I. Abtheilung. Wien. A. Hoelder, 1898. p. 28.

ingestion of uric acid and its congeners. Other conditions, which by some have also been ascribed to a uric-acid diathesis, such as muscular rheumatism, diabetes, leucæmia, etc., were excluded from investigation, as sufficient evidence has not as yet been advanced to warrant the conclusion of a causal connection existing between these diseases and the diathesis in question. The results obtained are given in Table II.

Upon studying this table, it will be seen that an absolute increase in the elimination of uric acid is only occasionally observed, viz., in cases 5, 7, 11, 13, 14, and 18, while an increase in the coefficient *uric acid : urea*, is obtained in almost all cases. An increase in the amount of alloxuric bodies, on the other hand, is likewise not constantly met with, but it will be observed that in some cases in which a normal amount of uric acid and a normal uric-acid coefficient are encountered the alloxuric bodies as a whole may be considerably increased. This is notably the case in No. 4, in which only 0.2336 grm. of uric acid with a coefficient of 1 : 92.0 was found, while the alloxuric bodies conjointly amounted to 1.3127. The alloxuric acid coefficient, however, was found increased in all cases, so that we are forced to the conclusion that, while the uric acid occurs in relatively increased amount in the great majority of cases of the uric-acid diathesis, the alloxuric coefficient is in reality the deciding factor, and plays an important rôle in the symptomatology of this condition.

From these observations, however, it would be erroneous to conclude that we are dealing with a uratic subject whenever the alloxuric coefficient is increased, as this may occur in a great variety of diseases, which unquestionably are in no wise dependent upon such an increase. Now, as before, then, the diagnosis of the uric-uric diathesis will have to be based not only upon the finding in the clinical laboratory, but upon the subjective symptoms and physical signs as well. Whether or not cases of the diathesis ever occur in which such an increase is not observed I am not prepared to decide from personal observations, but admit that it is quite possible.

In conclusion I wish to insist upon the necessity of a quantitative estimation in the diagnosis of the uric-acid diathesis, and that not too much reliance be placed upon a simple macroscopical or microscopical examination of the urine. At times, of course, this may be sufficient, when very heavy sediments occur, but more commonly the greater portion of the uric acid is held in solution, and would escape detection altogether, unless a direct quantitative examination were made.

RETROBULBAR NEURITIS.

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There is much in the subject of retrobulbar neuritis to engage the attention and the interest of the intelligent practitioner. It is a disease, in the first place, which merits attention by the fact that our information and knowledge regarding it are still decidedly insufficient, and, indeed, we sometimes commit ourselves to a diagnosis of its presence solely on the strength of certain subjective symptoms when the patient presents to us no objective signs which would confirm our opinion.

Another important feature about retrobulbar neuritis is the marked —indeed, startling—contrast which it presents, in regard to symptoms, signs, etiology, prognosis, and treatment, with the form of neuritis with which one is more familiar in connection with nervous diseases.

A third point is that under the head of this name we group a number of diseased conditions which have, as we shall see, certain elements in common, but which differ widely in mode of origin, in cause, in appropriate treatment, in prognosis as regards life and as regards vision.

Some time ago a very interesting discussion took place at the Ophthalmological Society of the United Kingdom, introduced by a valuable paper read by Mr. Marcus Gunn, upon this very subject; but, able and instructive as both paper and discussion were, there was manifested a tendency to limit the field of view to one which, in my opinion, was too narrow for the real range of the subject.

The name of retrobulbar or retro-ocular neuritis was introduced by von Graefe to indicate such inflammatory diseases of the optic nerve as arose by continuity of tissue with other inflamed parts, or which took their origin not from alteration of intracranial pressure, but which began primarily in the optic nerve just as they might do in any other motor or (common) sensory nerve, to be followed by loss of function. Since in a certain proportion of cases no ophthalmoscopic changes were seen, it was natural to refer the seat of lesion to a portion of the nerve behind what could possibly be examined, while the occurrence in other cases of evident inflammatory alterations, followed by marked atrophy, gave one the key to their true nature, and enabled one to be confident that a stage of inflammation had been passed through, even in the cases which merely exhibited in the ophthalmoscopic picture the appearance of atrophy.

The definition of the disease suggested by Mr. Gunn, while it tends in my judgment to exclude some of the group, is certainly very valuable and will repay careful study. He says, "Rapid failure of vision, usually in one eye only, often accompanied by pain and tenderness in the neigh-

borhood, absence of early ophthalmoscopic changes, and a tendency to recovery, are the usual prominent features." I propose to discuss these features one by one in order that we may obtain a clear idea of the disease, while at the same time I shall indicate certain facts regarding the disease which seem to me not to be strictly in accordance with Mr. Gunn's definition.

1. *Rapid Failure of Vision.* The failure of vision which occurs is of a peculiar type, inasmuch as it affects principally or solely the central region of the field. The degree of defect varies from a mere loss of definition of the outlines of objects, especially under certain particular circumstances, as we shall see immediately, to a complete though circumscribed loss of perception of light. Thus, the patient may have 6/VI of vision or absolutely none in the central area. In the less severe cases there are two methods of testing in particular which are of much practical value, viz., testing with colors and with Bjerrum's types. In regard to colors we find that the patient will display an inability to perceive accurately with that portion of his retina which is in the immediate neighborhood of the papilla and macula the tint of a small object of from 3 to 5 millimetres in diameter held at a distance of a couple of feet. Such an object held at such a distance from that part of the normal retina is quite capable of arousing a precise estimate of the color which it possesses, but not in such patients as we are now considering. The patient is made to look fixedly at a small white spot on a blackboard, while one places in the near neighborhood of the white spot, but to its outer side, a suitably sized colored spot painted on, or affixed to the end of, a black rod, when it will be found that in a moderate case blue and yellow are fairly correctly seen, while red and green are lost, and appear as yellow and white respectively. It is on account of the perception being retained of the yellow which is always mixed with our commercial reds, as well as to loss of saturation, that red is pronounced to be "yellow" or "brass-colored;" and we frequently notice, too, that a patient will call green "blue" because of the presence of blue in the green employed. It is only in rather bad cases that perception of all colors is lost at the centre; in the majority perception of blue and yellow is retained—of those colors usually which seem, by the fact of their having a larger field of visibility in normal conditions, to have a greater hold upon the retina, so to speak. That the perception of red and of green is less intense in the normal individual, is less a part of our nature, if one might use the phrase, seems also to be indicated by the fact that where congenital color-blindness is present, the probabilities are greatly in favor of its being of this type rather than of the blue-yellow type. In fact, it is only very rarely that persons have difficulty with those latter colors, confusion of which, however, is sometimes seen as a hysterical condition. It has been stated by some authorities that the periph-

ery of the fields as regards color in those patients of whom we have been speaking is apt to be restricted; from my own experience I cannot confirm this assertion, and do not consider it to be accurate.

Bjerrum's types, just mentioned, consist of a series of letters printed on a board much as the ordinary test-types are, but the contrast between the print and the background is reduced by printing the letters in dark gray upon a background of lighter gray (or *vice versa*) in place of black upon white. They may also be printed in green on a faintly green background. Thus the ability to distinguish minor degrees of contrast is tested. These types are made in various ways, but the system which seems to me best is to have the letters from the top of the board to the bottom all of one size, but the contrast between letter and surface diminishing toward the foot. It will be found on examining a patient with retrobulbar neuritis that his vision with these types is bad out of proportion to the degree of his defect with the black-on-white types; he has difficulty in perceiving differences where the contrast is slight. The patient often tells us the same facts about himself spontaneously, for he will say that he has great difficulty in recognizing the faces of his friends. We recognize faces largely by our knowledge and perception of the small differences in illumination, shade, tint, etc., arising partly from the prominence and retrocession of features, and if these are blurred and blotted, if only coarse and harsh contrasts can be appreciated, a face will not be recognized. Our patient knows the figure, perhaps the peculiar walk, of an acquaintance, but the features he cannot be sure of except close at hand.

Now, the point in regard to this failure of vision which next merits attention is the influence exerted by variations in the amount of illumination. Many of such patients may tell us (though here again, of course, they are little liable to notice the fact when one eye only is affected) that, while vision is bad during the bright hours of the day, it improves in the evening or in dull light. It is not at all probable that there is any actual improvement in the acuity of vision, at least I am not aware that any such has been proved, but at all events it is true relatively that the patient sees better in a subdued light. Why this should be is not easy to say, but it is possible that it may be due to the exhaustion by the brighter light of the affected fibres of the nerve. In this connection, too, it has been observed that vision is better after a night's rest, worse on fatigue or prolonged want of food.

The patient is apt to complain of a fog or mist before the eye, usually of but slight density; and this not in proportion to the degree of defect of vision. Thus a patient whose vision is nearly normal will complain much of this fog, while another whose vision is very much lowered will admit perception only of a delicate, luminous, perhaps faintly colored haze. Sometimes this haze moves or shimmers like the heat haze we see

on looking at a landscape on a hot summer's day, or like the appearance seen on looking over the top of a burning lamp or gas-jet. This appearance is probably due to the insufficient "insulating" of the nerve fibres as a result of the inflammation, the nervous stimulation thus passing from one nerve fibre to another contiguous one.

In retrobulbar neuritis one never meets with a certain symptom present in ordinary neuritis in a considerable proportion of cases, and which was first described by Hughlings Jackson, the occurrence, namely, of temporary, almost momentary attacks of blindness.

2. The second point in Mr. Gunn's description of the disease is that the condition is *usually present in one eye only.* It may be that this is true, but the truth of the statement will depend almost completely upon whether one regards tobacco (and other toxic) amblyopia as a variety of this disease or not. It is difficult clinically to make a hard-and-fast line of distinction, and it is probable that the conditions differ rather in degree than in nature. I do not wish to discuss the matter at present; I may recur to it on another occasion. I would only say now that many points are in favor of the opinion that toxic amblyopia, if it be not actually neuritic, if there be lacking some of the real inflammatory element, is at the least so very closely allied to neuritis, and is so apt if untreated to go on to permanent alteration of tissue in a manner so similar to that brought about by a neuritis, that I for one cannot put the two conditions into separate categories as altogether distinct and non-related entities, as some do. Looking to the comparative frequency of toxic amblyopia, I can only with reservation admit that the condition is usually present in one eye only. But even leaving out of account for the meantime the cases of toxic amblyopia, it is not such a very infrequent occurrence that a patient recovers from an attack of retrobulbar neuritis in one eye only to be similarly affected in the other. I have seen this occur in a patient apparently in other respects in perfect health, except that she—a strong young woman about thirty years of age—was rather rheumatic in temperament.

3. The lesion is often accompanied by *pain and tenderness* in the neighborhood, in those cases at least in which there is inflammation of neighboring structure. It is an interesting question whether if the inflammation be limited to the nerve itself any pain will be experienced. Does the occurrence of pain not depend upon neighboring tissues and the nerve sheath being involved? We do not know whether the optic nerve has any "common" sensation or not; there are records to show that on section of it a sensation of very bright light is experienced, and there are also observations directly contradictory of this. Even if a sensation of light be experienced, that would not prove the question. Pain is but rarely complained of spontaneously in cases of retrobulbar neuritis, but the patients very often admit a sensation of weariness,

aching, or discomfort on forcibly moving the eyes in one direction—in my experience this direction is usually upward. Some have attempted to make out that there is a certain relation between the painful direction and the area of the field chiefly involved—*e. g.*, that if pain is felt on looking upward, the upper region of the field will be found to be the most seriously affected; for my part I have no evidence of the truth of this assertion, which seems to me, indeed, to be unsound, and not to be substantiated. The pain on movement is no doubt to be attributed to the tension of the sheath of the nerve (itself probably inflamed) on exaggerated movements. Pain, or at least some sense of discomfort, is apt to be experienced too when the eye is even very gently pressed back into the orbit by the fingers placed over the upper lid, but this is by no means constant and may be due solely to pressure on an inflamed periosteum. There is in some cases spontaneous complaint of a dull ache in the forehead, not amounting to pain.

4. *Absence of early ophthalmic signs* is a feature of great importance, and, since some cases run their course from beginning to end with practically no change in the aspect of the disk whatever, one ought, perhaps, rather to say that ophthalmoscopic signs are usually absent in the early stages, and may be absent altogether. However, it is more usual to find certain manifestations becoming obvious as the disease progresses. And it is most certainly true that in the great proportion of cases with which we meet, the ophthalmoscopic appearances are trifling in proportion to the alteration of vision, are very slight relatively to the gravity of the lesion as regards sight; and herein these cases form a marked and striking contrast with those of ordinary optic neuritis, for in this latter condition the ophthalmoscopic changes may be very great while vision remains perfectly unaltered as regards acuity, field, color, perception, etc., where in fact the visual symptoms are *nil*. The changes which are usually to be found in the later stages, and which may be present even in the early, are (1) slight general increase in the vascularity of the disk, which acquires a grayish-pink color, this being more marked in some districts of the nerve-head than in others; (2) fulness and tortuosity of the larger veins, which acquire a more distinctly marked double contour and light-line along with their darker color, on account of their more decided cylindrical shape and circular form in section; (3) a faint blur or haze hanging like a fine cloud or mist over the disk, suggesting an infiltration of that portion of the vitreous humor immediately overlying the nerve-head; (4) slight indistinctness and lack of definition of the margin of the disk, which fades almost imperceptibly into the surrounding fundus. Such are the signs, all nearly invariably being but slight in degree, which are most usually to be seen when first there is any manifestation; but in a certain number of cases even in the earlier stages, and in a very large number in later stages, there is on the con-

trary marked pallor of the disk, at all events, of its outer quadrant. This pallor is usually simple—that is, without any other change such as evidence of perivasculitis or of deposit in the physiological cup, or any material alteration in the calibre of the vessels, or hemorrhage in the neighboring parts of the fundus. Diminution in the size of the retinal arteries is, however, sometimes present quite early, and in most cases appears sooner or later, and there may be some blurring and disturbance of pigment about the margins of the disk, especially perhaps to the outer side.

5. The *tendency to recovery* is also an important feature in the unilateral type of retrobulbar neuritis. In the majority of such cases the prognosis is decidedly good, and one is justified in expecting distinct improvement after the lapse of a very few weeks or even not many days. This amelioration is in fact sometimes synchronous with the appearance of visible ophthalmoscopic changes, if the injection has spread down to the disk, so that we have the curious state of affairs that a patient is improving in symptoms while the signs are becoming worse. In a large proportion of the cases the recovery of vision seems to be absolutely complete, but this is a matter somewhat difficult of proof, because the final stages are apt to be slow, and patients are thus apt to be neglectful to return for examination; they feel quite well, have returned to their ordinary habits and duties, and tend to postpone the final examination *sine die*. In a number of the "recoveries," however, it is more than probable that careful perimetric testing would elicit the existence of a small paracentral area of still deficient vision with imperfection of the color sense. All cases, too, do not recover, and in a certain percentage a decided and perhaps an absolute scotoma remains permanently. Here again we often see a marked disagreement between the signs presented and the symptoms complained of, for a patient may have optic disks almost dead-white in color, and retinal arteries small in calibre, and yet possess capital vision, or, on the other hand, good-looking disks with only a slight degree of pallor at the outer quadrant, hardly more than is often present under physiological conditions, and yet a distinct and distressing scotoma.

I pass by the subject of the microscopic appearances of retrobulbar neuritis, since so careful and able an account of these appeared so recently in this JOURNAL (September, 1897) from the hand of Dr. de Schweinitz, whose observations practically corroborate those made in the first instance by Samelsohn.

But to turn to the larger sense of the subject of retrobulbar neuritis, and to include in one view all those cases and types which I believe to be of one and the same character, though manifested somewhat differently under varying circumstances, and to include under one heading all cases with a similar "local" pathology (if the phrase may be per-

mitted), I should divide the cases somewhat in the following manner: Retrobulbar neuritis may be unilateral or bilateral.

(*a*) A unilateral neuritis may be due:

1. To the spreading to the nerve of local inflammation.
2. To syphilis.
3. To rheumatism.
4. To gout.
5. To malaria.

It is of these unilateral cases that we have chiefly been speaking hitherto; but I fail to see any essential feature, save in the facts that they are unilateral and tend to recovery, wherein they differ from the (*b*) bilateral variety, of which I recognize the following forms:

1. Those occurring along with diseases of the spinal cord, especially locomotor ataxia and disseminated sclerosis, as well as with general paralysis of the insane.

In this class the inflammatory element may be almost completely eliminated, and the cases may be and very often are regarded as optic atrophy.

2. Those progressive cases occurring simply—that is, without any apparent relation to cord lesions, just as the ordinary type of optic atrophy occurs sometimes. It is true of this retrobulbar atrophy (for in this class also the atrophic character is the more obvious) as it is true of the ordinary optic atrophy that in a certain number of these patients spinal or head symptoms may eventually be manifested, although only after the lapse of a long time; but in a certain proportion also no such symptoms are ever displayed.

3. Cases of what has been called stationary scotomatous atrophy. This is not a good name for the condition, for one associates the idea of a progressive deterioration with the word atrophy, but there is none here, and we have a contradiction in terms. In these cases, most frequently in young persons, we find a central scotoma, usually small and generally, but not always, absolute, along with a very white and even chalky looking nerve-head, and with vessels, especially the arteries, somewhat diminished in calibre. In some of these cases there is a history pointing to a meningitis or possibly a periostitis at the apices of the orbits, or in the neighborhood of the foramina some time previously, but this is not the case in all.

4. Cases of what is known as hereditary optic atrophy. In this condition we have another instance of the unfortunate use of terms, for the disease is not primarily—as I believe—an atrophy, but a neuritis, and it certainly is not, strictly speaking, hereditary. "Leber's atrophy," as the condition is sometimes called, after the professor in Heidelberg, who has given a classical description of it, is a most interesting malady, but this is not the place to do more than merely indicate its outlines.

It is apt to manifest itself among the males of a family as they attain the age of eighteen to twenty-three years; the parents have usually been quite healthy, but several of the sons are attacked by it one after the other as the age indicated is reached. The daughters of the family (sisters of the patients) are usually quite free of the disease, but may transmit it to their sons. Both sons and daughters of the patients themselves may remain, and usually do remain, healthy, but the daughters may again transmit it to their sons; the liability usually dies out in the third generation. When women are affected by it, the amblyopia usually comes on much later in life, about the menopause, rather than in the early adult period. In the case of males the patients are usually in perfect apparent health, and no cause can be assigned for the onset of the blindness, which may come on with great rapidity, a few days sufficing practically to extinguish vision, while in a certain number of instances even more rapid loss of sight would appear to have occurred. Over the central area of the field of vision the amblyopia may be complete, perception of light even not being retained, and the only portion of the field remaining may be a mere ring around the periphery. All cases are not so bad as this, and even at the centre the scotoma may not be absolute. So far as my experience goes there is no peripheral restriction of the field. It is not always possible to distinguish between this class and that of the stationary scotomatous atrophy.

5. Without prejudice to the question of the precise condition of the nerves and their vascular supply in such cases, I think one may fairly include here the cases of toxic amblyopia, typically represented by "tobacco blindness," as coming under the same category. Whether or not there is in this condition an actual neuritis—and for my part, I think it highly improbable, for many reasons—there can be no doubt that the borderland which separates toxic amblyopia from retrobulbar neuritis and the atrophy which is so apt to follow is very narrow, and is very easily overstepped by a patient who will not take warning as to his state of health, and will not moderate his supply of tobacco, alcohol, or whatever may be his particular "indulgence."

So far as regards the treatment of retrobulbar neuritis generally, it is not necessary to say much. In the unilateral cases one must attack vigorously the vicious diathesis, whether syphilis, gout, or what not, which has led to the condition, and at the same time use derivatives and local depletion. For example, in the distinctly rheumatic cases I place most reliance on purging, salicylates, and blistering applied to the temple. At the same time one must encourage a hearty, vigorous action of skin and kidneys, by warm baths or even Turkish baths, by keeping the patient wrapped in flannel, and if needful by drugging with diuretics and diaphoretics. I believe that subcutaneous injection of pilocarpine will be found as useful in this disease as it is in persistent

scleritis. Some place much faith in iodide of potassium and in mercury, even when syphilis is not present.

In the more long-standing cases, and especially in those which are more nearly allied to atrophy, strychnine is our chief reliance; but even strychnine has but little influence on the course of the disease.

It should not be forgotten that recurrence of an acute attack is rather apt to take place on exposure to conditions similar to those which brought it on before; therefore patients ought to submit for the future to regulations of diet, dress, and habits, since a second attack is more likely to leave permanent and great evil results than a first onslaught.

HEAD-NODDING AND HEAD-ROTATION USUALLY ASSOCIATED WITH NYSTAGMUS IN VERY YOUNG CHILDREN.

WITH REPORT OF TWO CASES.[1]

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Of all the functional nerve-diseases of children few are more rare and none possess greater interest than the rhythmical nodding or horizontal rotary movements of the head, commonly associated with nystagmus. Medical literature makes scant mention of these cases. Some of the books on diseases of children briefly refer to the disorder, but seem to confuse the reader by associating it with *epilepsia nutans* or *tic salaam*, which, without doubt, is a true epilepsy.

In 1851 Romberg and Henoch published the first observations of this peculiar affection that I have been able to find; later Hadden, of London, reported a series of twelve cases, and referred to similar ones; soon after he reported another series of ten cases; lastly, in 1892, Peterson, of New York, detailed five cases. Others, to whom due credit will be given, have reported cases, but the fore-mentioned observers have contributed about all that is known of this curious disorder.

In the very able address of J. Hughlings Jackson before the Ophthalmological Society of the United Kingdom, in 1889, occurs the following: "Physicians should try to help ophthalmology by bringing forward cases little likely to come under the notice of ophthalmic surgeons. Cases of spasmus nutans with nystagmus (a variety, I think, of spinal, or rather spinal system chorea, a symptomatic condition akin to canine chorea) would as 'living specimens' interest all our members." This was said eight years after Henoch's last published observations, and thirty-

[1] Read before the Ohio State Medical Society, May, 1898.

eight years after Romberg, Henoch, Faber, and Ebert had published cases; yet it remained for Hadden, in 1890, to differentiate clearly head-nodding from *epilepsia nutans* or *tic salaam*. And it is to his clear sight that we are indebted for the observation that "There are cases of nystagmus unassociated with head movements the nature of which is hard to explain, . . . some, at least, of these instances are, in my opinion, fundamentally the same as the class under consideration."

The quotation from Jackson is given not alone for the purpose of calling attention to the confusion then existing in regard to the disease, but to serve also as an apology for reporting the following cases:

CASE I.—E. G., a large, healthy appearing, breast-fed female, sixteen months old; born at term after a short normal labor of a healthy mother. The father is well but absolutely deaf from a large dose of quinine. The patient has a strong-looking brother of ten years that possesses a well-defined rhachitic rosary and bowed shins. One sister, two years older than the patient, while under my care, died of tubercular meningitis. Although the child is large and plump, the osteal epiphyses are enlarged, and a well-marked rosary is felt. The anterior fontanelle is nearly closed and twelve strong teeth have erupted. No other *stigmata* are present.

The mother says that this is the first sickness of any kind that the child has suffered. It was noticed for a week preceding my visit that she kept turning her head from right to left in a curiously rapid and regular manner, also that she appeared fretful and vomited frequently. On examination I found that the circulation and temperature were normal; tongue was coated; bowels constipated; appetite good, but without apparent cause she had vomited three or four times in the forepart of the day; to use the mother's expression, "had spewed about a yard." When questioned, the mother admitted that the child had tumbled down and bumped its head, to which she seemed to attach little importance, for she added, "that it got no more than its share of bumps."

The movements of the head were distinctly horizontal and rotary; they stopped during sleep, and were for a few seconds arrested when the attention was strikingly drawn. The sight of my watch stopped them, but in an instant they were resumed, although she continued busily looking at the dial. A sharp whistle had the same evanescent effect. The movements were singularly smooth, easy, regular, and in almost perfect rhythm, and occurred about seventy-two to eighty times a minute. The excursion began with the chin a trifle to the left of the median line and was carried horizontally to the left about 40 degrees, and then brought back to repeat the act. As before said, the movement was smooth, easy, and rhythmical, without any spasmodic or jerky elements whatever.

While observing these gyral movements of the head I discovered a rapid horizontal nystagmus of the left eye, made more distinct or increased when the eyes were directed to the left. From the notes of Dr. William Brunner, who at my instance kindly examined the eyes, I quote the following: "Examination of the eyes of E. G. shows a slight convergent strabismus; fixation with the right eye. In the left is a fine rapid horizontal nystagmus slightly more marked, perhaps, when she

looks to the left. The outward movement of the left eye is probably limited to a slight extent. The nystagmus is present whether the patient has both eyes open or only the one; the pupils are equal and respond promptly to light and accommodation. The pupils were dilated with homatropine to afford a better view of the fundus, but the child was so restless that I could not get a satisfactory view of the optic nerves and only an imperfect glimpse of the rest of the fundus. No pathological condition was discovered. It is regretted that my examination does not afford more satisfactory and definite information of this most interesting case."

My unfortunate experience with the elder sister naturally led me to fear some tubercular disease of the brain, but, when the tongue cleaned and the vomiting ceased under indicated medicinal and dietetic measures, this fear subsided, and I realized that I had to do with one of those rare cases of gyral movements of the head associated with nystagmoid movements of the eyeball.

Small doses of iodide of potassium and quite large doses of bromide caused the abnormal movements of the head and eye to cease in less than six weeks. On two occasions during the last six months some slight gyral movements have been observed and at present there are times when a slight horizontal nystagmus can be demonstrated. As time advances a marked outward bow of the legs confirms the opinion that we have present an unmistakable rhachitic diathesis.

Case II.—G. L., a fair-sized male child, twenty months of age, the third son of healthy parents, born after a normal labor. The other children are quite healthy except the eldest, who was under my care about one year ago for a mild chorea.

The patient was brought into the Neurological Service at the Cleveland General Hospital in January, 1898. I found, on examination, beautifully marked gyral movements of the head, that ceased during sleep and while lying down. Placing the child in a horizontal position without support to the head, the gyrations ceased and appeared only when again placed erect. The movements were momentarily arrested when the attention was strikingly drawn; they occurred about eighty times a minute and were smoothly horizontal, constant, and rhythmical.

The eyes appeared normal and without nystagmus until the head was firmly grasped and fixed, when a fine horizontal nystagmus appeared in the right eye, and continued as long as the head was fixed, but ceased immediately when the head resumed the gyrations that promptly followed its release. No nystagmic movements could be induced by straining the sight to any angle while the child was recumbent.

Holding the head in any particular position while the child was in a recumbent posture also failed to bring out the nystagmus. The disks were normal, and no weakness or spasm of any of the eye-muscles could be demonstrated.

Although the child appeared plump, it was pale and flabby, with coated tongue, and had a history of green stools, vomiting, and other signs of gastro-intestinal disturbance. Two weeks before it had suffered a hard fall from a chair, but apart from a bruise on the scalp no other damage resulted. The fontanelles were a little slow in closing, and the eruption of teeth irregular and delayed, yet no rhachitic, luetic, strumous, or tuberculous diathesis could be defined.

It had recently recovered from whooping-cough, which was the only

sickness that ever demanded the attention of a physician. The case was under observation about eight weeks, at the end of which time the movements of the head had ceased, but the nystagmus was occasionally observed. I have lost track of the case, and am unable to tell in what condition the little patient has been since the last visit to the hospital.

From these two cases a fair knowledge of this affection may be derived, but for the sake of brevity and clearness it will be well to quote the general description that Hadden gives of the disorder in his series of papers on "Head-nodding and Head-jerking in Children, Commonly Associated with Nystagmus:" "... characterized by nodding or lateral movements of the head, either singly or associated with one another or with movements of rotation. Further, these movements of the head may be almost constant, or may occur more especially during efforts at fixation or during excitement, always ceasing during sleep or when lying down. In most cases there is nystagmus of one or both eyes, vertical, horizontal, or rotary, often occurring simultaneously with the onset of the head-movements, but sometimes preceding them or following them. The nystagmus is much more rapid than the head movements, and has an independent rhythm; it is aggravated by attempts at fixation or by forcibly restraining the head, and may even be induced, when previously absent, by those means." The most of these cases occur in very young children. The affection is usually transient, and appears to depend upon rhachitis or some other nutritional vice that renders operative slight irritations, as dentition, gastro-intestinal disturbances, or perhaps a cerebral concussion.

It would be interesting in this connection, did space permit, to give in brief the comparatively few cases that have been reported. Study of these cases convinces the writer that no good is to be subserved by dividing the cases of head-nodding and head-shaking into separate classes, as one of these movements may replace the other, or a combination of both movements be observed in the same case.

It follows that Peterson's suggested term, gyrospasm, is not comprehensive enough to include the varieties which our present knowledge convinces us belong in the same category. The term, nodding spasm, as well as gyrospasm, is to be rejected for another reason fully as good: they are in no sense spasmodic movements, but monotonously regular, smooth, easy, and rhythmical.

These valid objections to the descriptive designations under which these cases have been hitherto reported has led me to the use of the title, "Head-nodding and Head-rotation Usually Associated with Nystagmus in Very Young Children," as a more correct description of a peculiar syndrome of the pathological basis of which we are at present ignorant.

Age. In the majority of cases the disorder occurs between the ages of six and twelve months, although Hadden mentions one at two

months, Gee one at six weeks, and Peterson one at three, four, and five months, while Henoch details its occurrence in a child of three years.

SEX. The records show a great preponderance of females attacked.

CHARACTER OF THE MOVEMENT. Pure movements of assent, like the nodding of "a mandarin doll," are rare; gyral movements are most frequent, although a combination or alternation of the nodding with gyral movements is common. The movements are singularly smooth, easy, regular, and rhythmical—free from the spasmodic action suggested by some of the names under which they have been described. In my first case reported the excursion of the gyral movement began near the median line and was carried well to the left. Hadden noted two cases with a like tendency, but the writer is unable to state whether the determination of the head to the side of the monocular nystagmus has any significance.

All movements stop during sleep, in the recumbent posture, and, Mills says, when the eyes are covered. I find little authority for the latter statement, although I believe it to be correct, at least in those cases associated with nystagmus. It was demonstrated in both of my cases. In both of the reported cases the movements ceased when the child was placed in a horizontal position, with or without support to the head. Although in both cases the movements stopped while the child was recumbent in bed, yet as the eyes followed any attractive object the movements of the head were almost ataxic and singularly like those of a very young child whose association movements are uneducated. If the head was grasped ever so lightly the movements ceased, and no sensation of movement was conveyed to my hands. They were arrested for a few seconds if the attention was strikingly drawn. Most observers have made the same assertion, although Mills inadvertently states to the contrary.

NYSTAGMUS. Nystagmus may be monocular or binocular, vertical, horizontal, rotary, or mixed and alternating—one eye presenting one variety, its fellow another. Hadden says that binocular nystagmus is most common, which statement is open to question. He also states that the nystagmus may or may not correspond in direction to the movements of the head, but study of cases leads to the impression that in purely gyral movements of the head we are more apt to have a horizontal nystagmus, while the pure cases of head-nodding (which are very rare) usually exhibit vertical movements of the eye. Norrie, Henoch, and Hadden have recorded exceptions to this rule. Study of cases reveals the interesting fact that most cases of gyral movements of the head were associated with monocular nystagmus. Hadden gives one case of vertical nystagmus of the lids as well as the eyeballs. It is the only one of its kind that the literature affords.

The nystagmus is rendered more marked or, if absent, sometimes

brought out by fixing the head (Case II. illustrates the latter statement); in point of time it is usually constant, aggravated by attempts at fixation, and is not modified or inhibited by change in posture. Conjugate deviation of the eyes usually accentuates the nystagmus. Gordon Norrie, of Copenhagen, alludes to a case in which a change in the character of the nystagmus took place when the eyes were turned in certain directions. My cases failed to show this phenomenon. The nystagmus usually precedes the development of the head-movements, and often persists long after the latter have disappeared, and may recur without their association.

One of Hadden's cases manifested a persistent nystagmus for one year, after which slight head-movements appeared. Case I. presents recurrence of the nystagmus during the attack of any one of the many little feverish affections of childhood.

Strabismus. One of Henoch's cases had a convergent strabismus of the right eye; Hadden reports squint to have preceded the disorder in one of his patients; Dr. Gee observed the same in one case, and it was slightly marked in one of the eyes of my first case. Recent examination shows complete recovery from squint.

Pupil. Hippus was present in Norrie's case; Hadden also observed one case. Of five cases in which Hadden made special examination of the pupils, in addition to the case of hippus mentioned, he records one case with poor pupillary action, with convergence; one where the nystagmic eye acted better consensually than with light.

Optic Disks. With the solitary exception of Hadden's case of pale disk, with a slight crescent of atrophy about the left, no changes of the fundi have been recorded.

Vision. The tender age of the reported cases has precluded investigation of the interesting question of the visual acuity. Cases have been followed for years yet no refractive or other ocular defects have been recorded. From this we would infer that vision is not necessarily at fault, notwithstanding Leszinsky's statement to the contrary.

Some of Hadden's cases had a curious way of loooking at objects: one turned its head away from the object and looked sidewise; another threw the head back and peered through half-closed eyes. This condition is not necessarily confined to this class of cases, as I have at the present time under observation a bright little boy of two years, who since birth has had a combined double lateral and rotary nystagmus with evident lack of visual power that is made manifest in many ways, but chiefly by looking sidewise with the head turned from the object.

That this peculiar phenomenon is not necessarily a result of nystagmus nor a cause thereof is shown by some notes of a case referred to me by Dr. N. S. Scott:

An hysterical spinster of twenty-nine years; clothed with the stigmata of degeneration; possessing a family history replete with dipsomania, hysteria, imbecility, and lunacy. Muscle-jerks all exaggerated; plantar reflexes absent; visual fields contracted for both form and color; slight horizontal nystagmus with extreme conjugate deviation of the eyes. She has rhythmical rotary movements of the head, and when she desires to look to the extreme right is compelled to turn the head to the left. This case has been regarded as hysterical, yet we must admit that the peculiar association of head-movements, nystagmus, and conjugate deviation of the eyes and head from the object viewed, is at least suggestive.

Relation to Epilepsy. Dr. Gunn, who examined many of Hadden's cases, suggested an alliance of these cases with epilepsy, and the latter was disposed to believe in the existence of the relation. Both of these observers witnessed a temporary abeyance of consciousness in two of the cases, neither of which, however, had a family history of convulsive disease. Out of a series of twenty-one cases observed by Hadden six yielded a family history of convulsions.

In Case III. of Hadden's the child was subject to sudden outbursts of convulsive laughter. Hadden seemed to think, as did Henoch, that these paroxysms of causeless glee were, in a way, related to epilepsy.

None of these cases have, as is the usual course of the early minor manifestations of epilepsy, gone from bad to worse or even developed a genuine case of convulsive disease. Unlike epilepsy, the tendency has been toward cure, and no case has been recorded that did not recover.

The writer believes that the facts recorded in the last paragraph dispose of the contention, which is obviously based on a paucity of observation and fact.

Exciting Causes. Henoch and other observers were quite sure that dentition was the chief exciting cause, and as the majority of the reported cases have occurred during that erethistic period of child-life, it certainly merits consideration. Hadden was disposed to recognize its claims, but broad-minded enough to confess mental reservation. Peterson's cases failed to impress him with its importance as a causative factor, and as one of his cases began at three months, one at four months, one at five, one at six, and one at seven months, we must recognize his doubt as natural and conservative. And since Hadden, Gee, and Peterson have observed cases at one and a half, two, three, four, five, and seven months, and Henoch at three years, we must confess, notwithstanding the occurrence of our cases in the period of dentition, a belief that it is best to reject dentition as anything but a predisposing cause, such as it undoubtedly is in a large number of the ailments of childhood.

Rickets and other nutritional disorders have been observed in connection with the disorder with enough frequency to merit our attention. Undoubted rickets was observed in nine cases of Hadden's series of twenty-one cases, and is markedly present in my first case. Neither

Peterson nor Henoch mentions it. Most observers have referred to gastro-intestinal irritation as a cause, and certainly my cases point to this as a factor.

Traumatism is by Hadden carefully considered and recognized, while Peterson, Hersch, and others regard it as the most potent of all exciting causes.

We must consider, before we accept these causes as *bona fide* ones, that, in the dispensaries of London, where Hadden observed his cases, rickets is the most common of all diseases of children, and that history of falls and bumps is but the daily history of childhood. Hadden reports three instances of head injury in his first series of cases; Peterson in two of his five cases; Hirsch in his single case; while in my Case I. it was doubtfully present; in the second it was undoubted. Peterson says: "Perhaps concussion of some kind may be found in most of the cases to be the determining factor—a concussion setting up, in the centres of the spinal accessory and at times in those of the oculomotor nerves, an arhythmic discharge."

Pathology. The pathology of functional diseases that possess inherent tendency to self-cure is quite sure, for time to come, to rest upon a basis of analogy rather than histological fact. And the time is also come when we no longer look to the microscope as the last and final court of appeal, for with the advent of the latest pathological science we are convinced that through the wonderful lenses we see but the ashes of perished fires. And while speculative pathology is not to be encouraged, yet the shrewd clinician is the man of all men to point the investigator to the seat of the disease. Henoch was prompt to suggest an irritation at the root of the spinal accessorius, upper spinal nerves, and motor oculi communis which demanded a nearness, of origin, of which the knowledge of that time afforded scant proof. To the comprehensive grasp of Hadden we are indebted for suggestions that, the writer believes, throw the best light on an obscure subject. "Hadden believes that the seizures point to instability of motor centres above the nuclei in the spinal cord and fourth ventricle, and he would, therefore, attribute the disorder to a functional or other disturbance of the cerebral cortex. The child has acquired certain voluntary or purposive movements of the head and eyeballs, but these have not as yet become thoroughly organized and fixed in the psycho-motor areas of the brain; hence a dissolution takes place because of the inability of the strained cortical centres to stand the work to which they have been too early subjected." (Mills.)

The writer, in considering the pathology of these cases, accepts as a fact the obvious relation of the head and eye movements; hence we have to consider an automatic head and eye-movement in a child of unstable nerve development, and at an age in which the associations of those necessary movements are being educated and fixed in the psycho-motor

areas of the brain. Any one that has observed the head and eye movements of the infant cannot have failed to mark the incoördinate attempts at associated movements of the head and eyes.

The fibrous connection between the visual areas of the cerebral cortex and the fovea centralis that is necessary to perfect vision does not fully develop until after birth, and only gradually becomes medullated and fit for function. After this process is completed, which takes place only when the cortical cell has attained a degree of maturity that provides ample nutrition for its axis cylinder, then the structural and physiological integrity of the central neuron is complete. During this time the same process of development in the peripheral neuron is going on with even greater rapidity, and we have the beginning of one of the most wonderful and mysterious processes of the nervous system—the communication between the central and peripheral neuron.

Binocular adjustment, judgment of fixed objects, spatial relations, including station, are acquired by the child as the medullation progresses. If this progress of medullary development of the nerve-supply of the eyes is either interfered with by disturbance of nerve nutrition or rendered functionally imperfect through early acquired opacity of the refracting media, or by congenital absence of a place in the retina that has more acute and perfect vision than elsewhere (fovea centralis), or a congenital defect in the receptive centre in the cortex, or an exhaustion of any of that delicate apparatus, then we are liable to get a rapid to-and-fro movement of the eyes—*nystagmus.*

Notwithstanding the statement of Leszinsky, the majority of these children have not defective vision, but develop nystagmus as a result of either cortical exhaustion or a disturbance of the conducting powers of the fibres; hence all of the impulses sent from the cortical cells to the muscles are either too feeble to reach their destination or are blocked by imperfections of the transmitting tracts, and we have a real corto-ocular paralysis agitans.

When we consider that a severe concussion may so disturb the cortical cells of a healthy adult as to produce a rapid though transient nystagmus, we cannot logically reject traumatism as an excitant of a more wide-spread and permanent, though like, condition in the unformed nervous structures of the infant.

If the relation that the ordinary head-wagging of the child with congenital nystagmus and that of paralysis agitans is due either to cortical exhaustion or to disease or defects in the medullation of the conducting fibres, we need not puzzle ourselves unduly over the association of the automatic movements of the head and eyes of infants as described in this paper. For in any child having the constant irritation of rhachitis and other nutritional disorders; of an unstable, unformed nervous system, spurred to its full capacity by the untiring energy of childhood, is

it a wonder that cortex and conducting paths become exhausted and take on such erethistic sensibility that any slight excitation—indigestion, fright, or a slight concussion—may set up irritative discharge of automatic nerve force that finds expression in the monotonous movements of the head and nystagmic twitching of the eyes, simply because they represent the highest development of the acquired association movements that the child is busily educating for the proper preservation of the highest type of animal life.

Diagnosis. The question of diagnosis is one of examination. Study of the reported cases, along with my own limited experience, convinces me that the imperative movements of the mentally defective and imbecile are easily differentiated. The spasmodic twitchings of epilepsy, the incoördinate, jerky, purposive movements of habit-spasm and chorea, essentially differ from the monotonously smooth nodding and gyral motions that are characteristic of the disorder under consideration. The peculiar head wagging noticed and admired as cute and pretty in precocious children when intensely interested, approaches the disease and indicates an actual strain of the association tracts. The wabbly, rolling heads of children with congenital nystagmus, vainly trying to fix head and eyes by the aid of a poorly endowed visual centre, either at the retinal or cortical end of a very complex and delicate connecting tract, bear some resemblance that the history alone will dissipate. The "head-banging" of Gee, in which young children turn on their faces during sleep and bang the face into the pillow a number of times; and "head-knocking," which in London is so often seen as a symptom of rickets in very young children, in which the little one seems earnestly happy while knocking its head with considerable force against some hard substance, are so totally unlike the preceding cases that one who has read carefully the accurate description of Gee and Hadden cannot fail to make a correct diagnosis.

Prognosis. The prognosis as regards life is good: no fatal case has been reported. Most cases tend to spontaneous cure in six weeks to three months, but many cases have a tendency to relapse if the child suffers any disturbance of health. Hadden observed one case that remained well for a period of two and a half years, and Gee's first case was found to be well and strong at the age of twelve years. While Hadden observed some slight mental deterioration, he was of the opinion that it would not persist.

Treatment. The treatment that has seemed to expedite recovery is in itself an argument in support of the cortical exhaustion theory: nerve rest by bromides; rest and increased nutrition of the brain by the recumbent posture. If the child is cachectic study the cause and remove it, be it struma, lues, tuberculosis, or rhachitis. Quite a percentage of the cases seem to have rhachitis, and unless this condition is

carefully sought, and treated by diet, phosphorus, and lime, you will not have done your whole duty. Most painstaking and thorough should be your investigation of the digestive system and correction of all its errors. Judicious warnings should be given to parents of precocious children, urging them to forbear the exhibition of the unnatural brightness of the tender little minds, and to protect them from traumatism, as these children seem to be prone to fall, because, as I believe, they are slow to acquire spatial and postural judgment.

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EXTERNAL URETHROTOMY.[1]

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External urethrotomy for the relief of stricture is an operation so frequently performed by the members of this Association that it is with some hesitation I bring it before them for their consideration and discussion.

My object in so doing is not to advance new or original methods, but rather to accentuate certain points in the technique of the operation and the after-treatment of the case, which in my hands have given better and more permanent results than are frequently encountered following this operative procedure. Such conditions as recontraction of the

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stricture, perineal abscess, or fistula, and uncured urethro-cystitis are not uncommon, being due partially to the patient's ignorance or neglect, and partially to faulty operative and post-operative procedures, and can in a great measure be avoided if the following points are carefully carried out.

Division of the Stricture. The patient having been properly prepared and placed, the urethra is opened on its floor by a single clean incision and all of the stricture tissue completely divided in the median line, not only on the floor, but also on the *roof* of the canal; this latter procedure I am convinced is not invariably carried out, as in many of these cases which I have personally examined, on endeavoring to pass a sound some time after the operation (in one case as early as the second week, in two cases at the end of the fourth week, and others at longer intervals) a mass of indurated tissue could be distinctly felt projecting from the roof of the canal, to pass over and, if possible, beyond which, the tip of the instrument had to be forcibly depressed toward the perineum; this mass I take to be uncut stricture-tissue, or if it was divided at the time of the operation, this was not completely done, or was not followed by proper local measures. It is claimed by some that cutting on the roof of the canal in this region is liable to cause severe hemorrhage; this accident, if it occurs, is due, I think, to over-zealous cutting, with a view to subsequently passing unnecessarily large sounds. In over eighty of these cases I have not had any hemorrhage either at or after the operation. In order to ascertain if all of the stricture tissue has been completely divided the index-finger, with the palmar surface directed upward, should be passed into the perineal wound and down to healthy urethra, well in front of the stricture, and then backward on the roof of the canal into the bladder, as on its way it readily detects any bands or masses that have not been thoroughly divided; whereas, if a sound passed from the meatus be alone relied on, it will usually enter the bladder with ease, as the floor of the urethra, being cut away, allows the convexity of the instrument to bulge down and out and the tip to slip over the obstruction on the roof, thus giving the operator a faulty idea as to the real condition of the canal. The dilatation of the posterior urethra by the index-finger passed into the bladder, prevents in a great measure post-operative tenesmus, as in the majority of these cases this portion of the canal is found to be so rigid, firm, and contracted that it often requires several minutes to overcome this condition and restore its normal patulousness; in other words, we over-dilate and paralyze the contracted prostatic fibres, and in this way prevent their physiological action for some time, thus giving the gland and bladder much-needed rest and reducing their inflamed and congested condition. The perineal operation being completed, a full-sized sound should be passed from the meatus into the bladder, to ascertain that the whole

length of the urethra is clear; if obstructions exist, they may be removed by meatotomy, internal urethrotomy, or post-operative dilatation.

Bladder Drainage. Bladder drainage after these operations is a most important factor, and seems, judging from the literature and the work of different operators, to be as yet an unsettled question, both as regards the best method of, and proper time for, the retention of the drain, some advising the use of a silver or soft-rubber catheter, draining through the urethra; others gauze drainage through the wound; some no drainage at all, and still others a large perineal tube, which latter method is in my experience far the best, if properly employed, as it keeps the bladder well drained, dilates the posterior urethra and, to a certain extent, the divided stricture, and is an ever-ready route for bladder irrigations, which are so essential in the treatment of the urethro-cystitis which so often exists in these cases, and which, strange to say, is so frequently ignored or overlooked. A large soft-rubber perineal tube is selected and introduced into the bladder just far enough to allow the urine to drain freely. This position is accurately ascertained at the time of the operation by irrigating the bladder through the tube and noting the amount and force of the outflow as the tube is slowly withdrawn. The tube is then secured in place by a heavy silk suture passed directly through it and both edges of the wound, which is then lightly packed with gauze, and the suture tied, thus preventing the tube from slipping either in or out; the bladder is then irrigated and partially filled with warm boric acid or salt solution and the tube clamped until the patient is put to bed, when it is attached to the usual siphon apparatus. The receptacle for the urine should be placed somewhat lower than the bladder, but not too low, as the suction then becomes quite strong and causes some patients painful sensations in the bladder, with, perhaps, tenesmus.

In from two to four days after the operation the tube is taken out, washed, and replaced; it is removed permanently on the fifth to the seventh day, and the patient is allowed to be up and about and passing his urine both by the urethra and the perineal incision, pressing a pad of gauze against the wound as he does so. In the majority of cases all of the urine is passed by the urethra in about one week after the removal of the tube, but in some the urethral wound remains patulous for several weeks. This usually occurs in cases in which the perineal wound has not received proper treatment, and when no sounds have been passed either at or after the operation; also in alcoholic or debilitated subjects, and in cases in which the urethra has been extensively cut for the cure of urinary fistulæ and sinuses.

Post-operative Dilatation. When the tube is first taken out, on the second or the fourth day, for cleaning, a medium-sized sound is passed to the bladder and held there for about a minute; this is repeated

regularly every second or third day, until the perineal wound is cicatrized, and the urethra taking a No. 28 to 30 French with ease, according to the case, when the intervals are made longer. It is surprising to note how little pain the passage of the first sound causes, provided it be warm, well lubricated, and introduced slowly, with its tip hugging the roof of the canal. After the sound is removed the tube is replaced and the bladder and urethra are gently irrigated with hot boric acid or salt solution, and on the alternate days, if indicated, with mild solutions of permanganate of potassium or nitrate of silver.

Treatment of the Perineal Wound. The perineal wound should be personally inspected every day to see that it is healing solidly from the bottom by firm, healthy granulations, and not allowed to bridge over in places or fill up with pale, flabby tissue. This can be prevented by running the finger firmly, but gently, through the bottom of the wound from end to end, the patient lying on his abdomen, or in the lithotomy position, with thighs widely separated, and in a good light; exuberant granulations are removed by the nitrate of silver stick or curved scissors, and the wound dressed lightly with gauze. When the perineal wound is cicatrized, the urethra taking a full-sized sound with ease and the urethro-cystitis improving, the patient must be made to understand clearly that the operation has not cured his stricture, but merely divided it, and that he must continue to have sounds passed at long intervals for the remainder of his life; also that he must not stop bladder or urethral medication until urination is normal and the urine practically free from tissue elements.

The following cases, briefly detailed, have been selected from my records, as they show results dating from two years to two years and a half after operation, and may therefore be considered of value. Many similar cases could have been given, but these were deemed sufficient to illustrate the above points. In one case the stricture was traumatic, in the others gonorrhœal in origin, one patient having three well-marked contractions. The operations performed included those of Gouley, Wheelhouse, and a combined internal and external urethrotomy.

Case I.—Patient aged forty years. One gonorrhœal stricture at bulbo-membranous junction, impassable to instruments. Severe urethro-cystitis. Wheelhouse operation. Fourth day: Perineal tube taken out, cleaned, and replaced, and a No. 25 French sound passed. Fifth day: Tube removed permanently. Seventh day: All urine passed by the urethra. Patient up and about. Fourteenth day: Wound cicatrized. Examination of this patient two and one-half years after the operation shows the urine to be clear, with a few light, floating mucous flakes, the urethra soft and taking a No. 28 French sound with ease. Urination is normal.

Case II.—Patient aged thirty-two years. One gonorrhœal stricture in the bulbous urethra, admitting a filiform. Severe urethro-cystitis.

Gouley's operation. Fifth day: Tube taken out permanently, and a No. 25 French sound passed. Patient up and about. Ninth day: All urine passed by the urethra. Fourteenth day: Wound cicatrized. Two and one-half years after operation this patient takes a No. 30 French sound with ease, urination is normal, and the urine practically clear.

CASE III.—Patient aged forty-five years. One traumatic stricture, admitting a filiform, at bulbo-membranous junction. Ammoniacal cystitis. Gouley's operation. Second day: Tube taken out, washed and replaced, and a No. 28 French sound passed. Fifth day: Tube removed permanently. Patient up. Tenth day: All urine passed by urethra. Sixteenth day: Wound cicatrized. Two years after the operation this patient takes a No. 30 French sound with ease, urinates normally, and his urine is clear, with a few light flakes.

CASE IV.—Patient aged twenty-three years. Three dense gonorrhœal strictures; two in pendulous urethra, admitting Nos. 15 and 17 French, respectively, and one in bulbous urethra, taking a filiform. Very severe urethro-cystitis. Internal and external urethrotomy. Third day: Tube taken out, washed, and replaced, and a No. 27 French sound passed. Fifth day: Tube removed permanently. Seventh day: All urine passed by urethra. Patient up and about. Fifteenth day: Wound cicatrized. Two years after operation patient takes a No. 30 French sound with ease, his urine is clear, and urination normal.

A REPORT ON SIX CASES IN WHICH THE BACILLUS AËROGENES CAPSULATUS WAS ISOLATED.

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THE occurrence of gas in the living tissues and the presence of gas after death in larger and smaller bubbles in the viscera, especially in the liver, has long been known, and the cause and significance variously interpreted by clinicians and pathologists. The appearance of the viscera when riddled with gas-bubbles is so striking and peculiar that they are described by the Germans as "schaumorgane," foam-organs. In some instances air embolism was held accountable for the condition, especially when occurring after surgical operations or after childbirth. It was suspected by others that anaërobic bacilli, wandering out of the intestinal canal after death, give rise to the gas productions. It was thus held to be a form of post-mortem decomposition, and little attention was directed to it until the appearance of an article by Welch and Nuttall in 1892.[1]

With the anaërobic bacillus, which they isolated in pure culture from the organs of their case and which they described and named the bacillus aërogenes capsulatus, they were able to reproduce in the tissues of dead

rabbits, after distribution of the bacilli through the circulation *intra vitam*, a complete picture of the so-called "schaumorgane" of the Germans. The causal relation between this condition and the bacillus was thus thoroughly established. Animal experimentation further convinced them that to produce such a general and extensive emphysema of the organs and tissues as was present in their case it was necessary to inject the bacilli during the continuance of the circulation, injection into the bloodvessels after death being followed only by an emphysema along the direct course of the vessels inoculated. This noteworthy fact, and the appearance of necrosis and degeneration in the tissues around the masses of bacilli and gas-cysts in the organs of their case, led them to suppose that a terminal infection with the bacillus had taken place. Except in its application to a very limited class of cases, the old views concerning the air-embolism were thus destroyed at one stroke. Too great credit cannot be attached to the authors of this article, as it has removed a piece of mediævalism concerning air-embolism from the minds of the medical profession.

To Eug. Fraenkel[2] belongs the credit of bringing out the causal relation between the bacillus phlegmones emphysematosæ and gaseous phlegmons. This bacillus is considered by Welch as identical with his bacillus aërogenes capsulatus. To the classical description of the morphology and cultural characteristics of the bacillus little of importance has since been added, except the discovery of the formation of spores on blood-serum by Dunham.[3]

Since the publication of Welch and Nuttall's preliminary study, and the study of Fraenkel on the bacillus aërogenes capsulatus, many instances of its occurrence have been described. A partial summary of the cases published previous to the year 1896, with further studies on the bacillus aërogenes capsulatus, is to be found in a second paper, not yet completed, by Welch and Flexner,[4] published in the *Journal of Experimental Medicine*, 1896. The association of a well-defined bacterium with the ante-mortem or post-mortem development of gas in the body is now well established, and a large number of illustrative cases is at our disposal, so that the record of new instances of the isolation of the bacilli aërogenes capsulatus would be itself of but moderate value. However, the conditions under which infection with the germ occurs, its full significance either as a primary or concurrent infection, and the relative frequency with which its presence is simply a post-mortem incident, offer such a series of unsolved problems as makes still desirable an increased number of examinations and records of experiments.

The intention of this paper is to give briefly the more important clinical data obtainable in the histories of six new cases examined by the writer, with the bacteriological analyses, microscopical lesions, etc. At the end of the description of each case a brief summary of the cases in

the literature having a direct bearing on the new cases will be given, special stress being laid upon the cases which have been described since those summarized in the later more elaborate publication of Welch and Flexner.[4]

The morphology and cultural characteristics of the bacillus isolated from our cases were identical, and, as they resemble exactly the description given by Welch, need only be briefly mentioned. Size of the bacillus is very variable, in general between 2 and 8 microns. Smears made from animal tissue reveal a marked tendency of the bacillus to occur as diplo-bacilli, a thin band of protoplasm occasionally connecting the rods. Long threads have exceptionally been met in preparations from gaseous phlegmons, but these threads have not been seen in the human blood or in preparations made from organs. Grown in artificial cultures, the rods appear thinner and attain a greater length. Stained by Gram's method, the bacilli appear thicker than when stained by Loeffler's solution.

Capsules were best demonstrated by the method recommended by Welch and Nuttall—that is, by fixing with moderate heat, glacial acetic acid being poured on the cover-glasses and replaced by strong aqueous solutions of gentian violet, and mounting in this fluid. The bacilli then appear even broader than when stained by Gram. By this method the capsules were always successfully demonstrated, and appear to have about the same breadth as the rod itself, and the tendency to form square ends is well made out. The protoplasm of the rod, stainable by this method, may be collected at one end of a slightly-tinged mass, the capsule, the rest of the rod being unstained, or both capsule and rod are short, as if cut off sharply at both ends, or again only the ends of the rod are tangible. Shadows are not infrequent, corresponding in size to the breadth of the rod plus the capsule. Welch,[5] in his article in the *Johns Hopkins Bulletin* on the pneumococcus, mentions similar forms for the pneumococcus, and regards them as empty capsules or involution forms. By Loeffler's stain the bacilli stain irregularly. The granular appearance is most marked in specimens obtained from gaseous phlegmons, with a tendency to heal, or where suppuration is present. The bacilli then appear longer, thinner, and are often vacuolated and with irregular borders. By Gram's stain the bacilli retain the stain uniformly, but occasionally a rod decolorizes. Decolorization of the bacilli grown in artificial cultures is more apt to occur. Where the capsules developed on artificial media the bacilli then did not differ in appearance from those occurring in animal fluids. In cultures few involution-forms were met. Grape-sugar gelatin tubes kept for three months, and then examined, showed the bacilli shrunken and thinner. My observations regarding this point are, however, too limited to be of value. Long threads extending nearly the whole length of the field

(homogeneous immersion 1-12 Leitz) were met in agar cultures, often markedly curved. But few cultures showed curved rods.

In my cases except that of the gaseous emphysema of the thigh large oval cocci without capsules were met, but were never recovered by culture. Ernst and Kronig have also met similar forms. No indication of the formation of spores was ever noted. The bacillus isolated from the case of hemorrhagic pancreatitis gave an abundant growth on blood-serum; no spores were seen on smears made from this growth, and inoculations from these tubes at various intervals of time failed to give a growth on transplanting. After four days' anaërobic growth the tubes were kept exposed to the air of the room. Perhaps spores are only obtained after complete exhaustion of the media in a hydrogen atmosphere.

Most of the cultures on sugar-agar stabs were incapable of transplantation after a week's exposure to the air. The longest time noted was sixteen days. Cultures capable of transplantation, when inoculated in large amounts, were often without pathogenic power. Unfortunately, none of my cultures was kept in the hydrogen jars for any length of time. A marked feature of the growth of this bacillus in grape-sugar agar was, that the older the generation the less abundant was the gas formation, the growth never being so active as in the first few generations. Coincident with the decrease of activity in growth was the total loss of pathogenicity toward guinea-pigs.

Welch and Nuttall[1] remark "that there were curious and not readily explainable differences in the vitality of the cultures, some being still alive which were under apparently the same conditions and of the same age as those which proved to be dead." This statement was fully confirmed, and no explanation is offered. Plates made from the liver of my third case, containing enormous numbers of bacilli, as revealed by smears, refused to develop but a single colony, whereas the plates of the intestines, using the same media and placed in the same hydrogen jar, were overcrowded. This incident was not an exceptional one.

Description of the Colonies, and Cultural Characteristics. The colonies, when overcrowded on sugar-agar pour-plates, are small, very dark, granular, and have branching projections; gas is almost always present.

The deep colonies, when less crowded, have a slightly yellowish tinge, and when seen by transmitted light after two days' growth appear rather large. They are mostly ovate or elliptical, opaque, and have a purplish tint; the edge is, for the most part, sharply defined and regular, but sometimes shows a fluted border, distinctly granular along the periphery. When the colonies reach the surface the growth spreads more or less evenly. The centre of the colonies is dark and is apt

to be opaque, color shading off to a pale brown. The translucent and transparent portions of the colonies show a distinctly wavy, linear, and granular texture. The edge, in many cases, is pale, very regular, and sharply defined; in other colonies single bacilli or chains of bacilli may be seen extending from the periphery of the colony, and clumps of numerous isolated bacilli, forming whitish streaks of growth, are met frequently on the bottom of the plates. Superficial colonies occasionally have a marked silky appearance.

The bacillus grows well in all the ordinary media.

In bouillon marked turbidity and a whitish deposit soon form, fluid settling and becoming clear after four days of growth.

On slant glycerin-agar growth occurs in the form of well-isolated colonies, the largest several millimetres in diameter. Colonies are whitish, show little tendency to become confluent, and the larger colonies have a slightly yellowish centre. With a Leitz three lens the individual rods on the edges are easily made out.

No growth was obtained on slanted coagulated egg albumin.

On potato, marked gas formation. Surface is wet; growth invisible, or in shape of slightly-yellowish colonies, or a thin whitish film spreads over the whole surface of potato. Condensation water is turbid and frothy. A very persistent stale-glue smell is observed on all the tubes. This odor is noticed on the hands after examination of the tubes, even before removal of the cotton plugs.

Milk coagulates on or before forty-eight hours' growth at 37° C. The coagulum, pierced by air-bubbles, floats on the surface of a clear serum, which is very acid. Coagulæ of smaller size adhere to the sides and bottom of the tubes. On shaking, clot sinks to the bottom. The growth is very characteristic.

Abundant growth in semi-fluid hydrocele fluid, with marked gas formation. No odor of putrefaction and no spore formation observed.

Two per cent. grape-sugar gelatin tubes, inoculated while fluid, allowed to cool and kept at room temperature, show numerous colonies, well isolated, appearing an inch below the surface. They increase in size toward the bottom of the tubes, where they attain a diameter of 3 to 4 mm. Gas is developed first on the third day, and becomes marked on the fifth.

Stab-gelatin tubes develop growth only along lower half of the puncture. Tubes after three to four months show slight signs of liquefaction. No spores observed. Sugar-agar tubes inoculated when fluid show a very marked development of gas.

On slant-lactose litmus agar-tubes there is a marked production of acid, with discrete colonies having reddish centres. Discoloration is prompt, complete usually after four days of growth. Gas is always found in the agar under the surface. On exposure to air the medium become reddish in a few minutes. No indol formation in Dunham's solution.

CASE I.—*Placenta Prævia Marginalis.* Post-mortem invasion by the gas bacillus. Housewife, multiparæ, admitted to the Sloane Maternity Hospital, November 16, 1896.

History. On October 25th patient lost about a pint of blood suddenly, and went to bed, where she remained. No further hemorrhage until November 8th, when slight bleeding occurred, and since then a little blood was lost each day. On admission patient was found to be close to full term. Child of good size, fœtal heart good. Cervix soft, admitted almost two fingers. Vaginal secretion abundant. Small lobes at the edge of the placenta could be felt, marginally at the left and anteriorly, the vertex being felt through the membranes on the right. No bleeding occurred from time of admission until delivery. Patient was apparently in good condition. Pulse, however, was not strong, and woman showed signs of blood loss. Podalic version, prolapse of cord, and extraction of child. Podalic version in two minutes from L. O. A. to R. S. A. easily accomplished. Membranes were then ruptured with intention of pulling foot through the cervix and leaving the patient to expel the child slowly. Very little hemorrhage (10 or 11 ounces) occurred during version, rupture of membranes. When finger sought anterior foot, it was found that child was riding on cord, which was inserted on the margin of the placenta. An attempt to dislodge the cord only resulted in its prolapse. Cord was pushed up as high as possible. A leg was pulled through the cervix. Ten minutes later, as child's heart was feeble, traction on both feet was employed and child was delivered in six minutes. Child was found to be asphyxiated. At the end of nine minutes placenta was expressed on account of hemorrhage. Not more than a pint of blood was lost in third stage. After a vaginal douche, 1–5000 $HgCl_2$ at 116° F., no more bleeding occurred. Laceration of right side of cervix extending into right fornix. Patient went into a condition of shock. Two and a half hours after delivery a hot saline infusion was given—Oiij in median cephalic vein. Three and a half hours later another infusion was given and patient vomited a large amount of fluid. Not more than 4 ounces of blood was reported as lost since delivery; half an hour later another infusion was given. At 8.15, half an hour later, woman was examined, and about 10 ounces of blood-clot removed from vagina. No rupture of uterus was made out, and the organ was found well contracted. Uterus and vagina were then packed with sterile gauze. Death at 9.30, five hours after delivery. Cause of death seemed to be shock due to rapid extraction, as the amount of blood lost was not more than 30–32 ounces. Child remained alive.

Autopsy by Dr. Ewing, twenty-four hours post mortem. Body that of a large fat woman, distinctly anæmic, no œdema. The right broad ligament and the tissues of the right pelvic region around kidney in mesocolon and over a considerable area of the mesentery are very emphysematous and infiltrated with fresh clotted blood. Peritoneal surfaces intact. A large irregular laceration is found involving the entire right portion of the os, extending from one to one and a half inches above the internal os, completely through the uterine wall and into the tissues of the broad ligament. Below it extended one inch into the vagina. Tissues of the uterus are flabby, otherwise normal. Two small hemorrhages are present in posterior wall of bladder. Firm adhesions over both lungs, which are moderately congested and œdematous. Heart

chambers empty and flaccid. Beneath the endocardium are seen minute air-bubbles. Valves normal; slight atheroma of aorta. Spleen extremely flabby and emphysematous. The liver is flabby and very pale. The surface is dotted with larger and smaller air-vesicles which extend below the surface, and similar air-vesicles are present throughout the organ. Inferior vena cava and hepatic veins are distended with frothy fluid.

Kidneys flabby, capsule free, surface smooth, except for a few medium-sized air-bubbles. In places there are areas filled with fluid resembling pus. There is a marked diminution in the amount of blood in the body. The blood which exudes from the veins at site of infusion contains no gas.

Anatomical Diagnosis. Rupture of uterus, acute anæmia, pulmonary œdema.

Smears from the liver, spleen, and uterus show large bacilli, apparently in pure culture. Capsules could be stained only by Welch's method.

Pour-plates, with dilutions, were made from the liver, spleen, and uterus on sugar-agar and grown in anaërobic jars at 37° C. The original plate of the liver shows several large air-bubbles, and, examined with a low power, it is seen to be overcrowded with numerous black colonies with branching processes. Colonies seem to be of one kind. Dilution-plates present pure cultures of the bacillus aërogenes capsulatus. The plates from the uterus and spleen reveal similar colonies.

Animal Inoculations. A guinea-pig inoculated subcutaneously in abdomen with 1 c.c. of bouillon in which a bit of the liver had been crushed develops a large fluctuating swelling, which breaks through the skin, with escape of a hemorrhagic fluid. Animal dies in four days, much emaciated. On section, hair with epidermis peels off readily. Whitish necrotic masses of tissue are found over the whole of the abdomen and thorax. Smears reveal typical large bacilli, retaining Gram's stain; also numerous smaller rods which do not accept the stain. Microscopic examination of the organs was negative.

A guinea-pig inoculated with 0.8 c.c. of the hemorrhagic fluid of the phlegmon develops promptly a swelling, which breaks through the skin three days later, with escape of hemorrhagic fluid. After ten days the front of abdomen and thorax has been converted into a suppurative and bleeding area. Animal dies in three weeks, much emaciated. On section, organs macroscopically appear normal, and cultures from heart's blood, aërobic and anaërobic, remain sterile.

A third guinea-pig inoculated subcutaneously with 0.2 c.c. of the same hemorrhagic fluid develops no local effects, and remains alive.

A rabbit was inoculated intravenously with 1 c.c. of a sugar-bouillon culture, grown for three days in a hydrogen atmosphere; it was killed a few minutes later, and its body placed for twenty-two hours at 37° C. On removal, body is found tremendously swollen, crepitation is everywhere present. On section, the subcutaneous tissues and all the organs are emphysematous. Smears reveal the presence of large capsulated bacilli.

A second rabbit was inoculated with the same culture, but kept at room temperature. On section, no emphysema or gas in any of the tissues or organs; marked post-mortem softening. Smears made from the heart's blood reveal a few large bacilli; cultures remain sterile.

A third rabbit was inoculated intravenously with a pure culture,

twenty-four hours old, representing a third generation, killed at once and placed at 37° for twenty-four hours. Body is much swollen and eyeballs project out of their sockets; crepitation and emphysema of the subcutaneous tissues. Liver is transformed into a granular, reddish mass. Gas is present in all the organs and vessels. Cover-slips reveal large capsulated bacilli, and by anaërobic culture of the heart's blood an abundant growth is obtained.

A fourth rabbit was injected intravenously with 3 c.c. of the same bouillon culture. No reaction observed, and remains alive. Animal is killed five days after inoculation, and body kept at 37° C. for seventeen hours; body was then found markedly swollen; gas is present in subcutaneous tissues, but not to so marked an extent as in former rabbit. Scrotum much swollen and emphysematous. Gas is present in all the larger vessels. Liver much softened. An anaërobic culture from heart's blood remains sterile.

The portal of entry in this case was undoubtedly the uterus. There was a rupture of the uterus through which the bacilli could readily obtain an entrance into the tissues during life. The bacilli need not have been introduced during the act of childbirth or version, but may have found the bleeding uterine cavity a suitable soil for growth, or at least existence, before labor occurred. Dead tissue, represented by the blood-clots in the uterine cavity, forms a favorable medium for the growth of the bacillus.

The presence of gas was especially marked around the uterus, the mesentery, and inferior vena cava, less so in the liver. This fact, and the long time after death at which the autopsy was performed, point to a post-mortem invasion of the bacillus and not to a terminal infection or even to an entrance into the general circulation during the death agony. Considering the late autopsy, one would otherwise expect subcutaneous emphysema to have developed. The microscopic sections of the liver show no evidences of a vital reaction around the bacterial emboli. The cells present no signs of degeneration, and their nuclei stain well. Around the gas holes there are no changes, except those due to pressure.

Cases Previously Described. In the last few years quite a number of interesting cases have been reported of infection through the genital tract, following upon abortion or during or after childbirth. The most important is that of Graham, Stewart, and Baldwin.[6] The patient was a laboring woman, married, aged thirty-five years. About fourteen hours before death the woman, who had been previously well, was seized with what she described as a severe chill, which lasted more than four hours. This was followed by pain in the region of the ovaries and uterus and by vomiting and purging. She was seen by Dr. Stewart at 1 P.M., five hours after onset of the first symptoms. There was extreme restlessness, distress, and pain in the lower abdominal region, and a slight flow of bright-red blood from the uterus. Abortion was suspected. Her pulse was 120. Morphine was administered hypodermically. At 3.30 P.M. she appeared much relieved and dozed off to sleep. At 9.30 P.M. Dr. Stewart found her "emphysematous from the top of her head to the soles of her feet." Emphysematous crackling

could be felt over entire surface of body. There was a diffuse, blood-red color of the whole surface of the body.

A case described by Dalton,[7] although the exact identification of the bacillus is not positive, is considered by Welch as belonging to a class of cases due to the gas bacillus, resembling Graham's case in that in both a criminal abortion had probably occurred. Present illness began a month ago with general malaise and muscular lassitude, menstruation came on and lasted one day, followed by intense headache and costive bowels. About one week ago vomited greenish matter several times. No appetite, tongue coated, liver enlarged and tender. Patient is jaundiced. Whole right pectoral region and arm are swollen and crepitate on palpation. Considerable pain in right breast and arm; respiration hurried and deep. Passages loose. Menstruation present. Many small punctures were made in right breast to allow escape of accumulated gas, having an odor of hydrogen sulphide. Respiration became rapid and difficult, lips and fingers cyanosed, extremities cold; emphysema extended up to neck and almost over entire chest. Died on third day after admission. Post-mortem twelve hours after death by Dr. Bremer. Crepitation of subcutaneous tissues obtainable in throat, thorax, abdomen, and upper extremities. Chest, right shoulder, and neck were puffy and discolored. All the organs were emphysematous. Uterus, 10 cm. in length, contained dark-colored material of the consistency of jelly; fetid odor; tissue firm, but crepitateed and floated in water. Reddish-brown clots in heart, which crepitated. The body was swarming with what he calls organisms. Dalton concludes that the bacillus of malignant œdema was responsible for the condition. The patient had produced an abortion on herself once three months ago and again recently, and Dr. Bremer considers the uterus to have been the point of entrance for the organisms.

P. Ernst[8] describes the case of a woman who developed putrid endometritis and septic peritonitis after removal of a macerated four-months' fœtus, the uterus, through doubt as to diagnosis, having been previously curetted, sounded, and tamponed. No development of gas *intra vitam* observed. At autopsy, made three hours after death, the entire uterine wall crepitated. Coagula in the right iliac vein and conus pulmonalis contained gas. Gas found in the myocardium, and especially in the liver, from the cut surface of which gas oozed up, and in a few hours formed a layer of foam several centimetres thick. Disappearance of the nuclei and other degenerative changes in the liver cells around the masses of bacilli led Ernst to believe that the lodgement of the bacilli in the liver took place during life. The development of gas holes in the liver, however, he regards as a post-mortem phenomenon.

Dobbin[9] describes a case in which a patient had been in labor for two days before admission to hospital. The diagnosis was made of a

generally contracted pelvis, conjugata vera 8 cm., large child. Position, left occipito-iliac anterior, impacted head, arrest of labor. A frothy, reddish-brown fluid, having a sweetish smell, escaped from the vagina and contained the gas bacilli in great numbers, as well as streptococci. During life no emphysema was detected. The body soon after death began to swell, and bloody, frothy serum exuded from the nostrils with escaping gas-bubbles. The gas bacilli were found in the vaginal discharge, placenta, and fœtus. Examination of the chorion showed that the large vessels were plugged with the bacilli. The villi are described as necrotic, but no sign of reaction on the part of the tissues was noticeable. Seven hours after death body was enormously swollen. No post-mortem.

Dobbin quotes a case of Schnell's—"Ueber einen Fall von Gasblasen im Blut einer nach Tympania Uteri gastorbenem Puerpera." After a prolonged and difficult version, eighteen hours after death the autopsy revealed gas in the heart, lungs, aorta, liver, and spleen. The case is rendered valueless because of Schnell's preconceived ideas concerning air-embolism and his apparent ignorance of the value of a bacteriological examination.

Menge and Kronig,[10] in their elaborate work on the *Bacteriology of the Female Genital Organs*, draw attention to the rôle which anaërobic bacteria play in diseases of the uterus, especially to those puerperal in their origin. Attention need be drawn to only two of their cases, puerperal patients with demonstration of the presence of the gas bacilli in the amniotic waters.

The first case was a primipara, aged twenty-six years, normal pelvis. Pains began February 15, 1894. In evening bag of waters still intact, rupturing next morning. In evening, attempts to deliver with forceps, without avail. After attempts again to deliver with forceps, cephalotripsy was performed. Bad smelling discharge from the vagina. Course of puerperium ran without fever. On the third day secretion of uterus was examined. Aërobic plates remain sterile. Anaërobic culture reveals the gas bacillus. On the ninth day the discharge was no longer badly-smelling, and cultures remain sterile. Although the woman had no temperature or other signs of infection, the perineal wound was not fresh, edges were covered with a grayish-white layer. The tissues in the neighborhood of the tear were necrotic, the resulting tear became three times its original size, and only slowly healed by granulation. Autopsy of child six hours after delivery, the weather being cold. The bacilli were demonstrated on smears and by cultures in the secretion of nose, throat, and armpits. Stomach distended with gas, which burned with a bluish flame and contained a brownish, greasy fluid, evidently the swallowed waters. In the pleura and peritoneal cavities there is a little blood-stained serum. Beneath the pleura pulmonalis, especially over the lower lobes, numerous bean-sized bubbles. Smears from heart's blood reveal thick bacilli positive to Gram's stain. Blood of the cord is sterile. From the lung and stomach the anaërobic bacilli were recovered by culture.

The second case was a primipara. Hard labor, turning unsuccessful, prolapse of cord. Pains began again after the narcosis. In evening of the same day, temperature 39.6° C., pains have ceased. Abdomen is distended over the uterus; no tympanic note. Fever indicated necessity for extraction of the child. After birth, bad-smelling fluid, with little blood but much meconium escapes. After delivery of placenta uterus was washed with permanganate. Fever disappeared after delivery of placenta. Patient left hospital on ninth day. Lochia examined on sixth day. Numerous cocci and thick rods were found. Aërobic plates remain sterile. Section of child immediately performed. Over lower lobes a few gas bubbles are present beneath the pulmonary pleura. Slight amount of bloody fluid in pleural and peritoneal cavities. Numerous rods present in the liver, lung, less abundant in the kidney and spleen, placental end of cord being sterile. Aërobic cultures from blood and organs, sterile. Anaërobic positive. Sections of the organs by Gram-Weigert method revealed the rods. Kronig describes what he calls a most characteristic rancid-butter smell to the cultures in grape-sugar gelatin, and this odor is noticeably present in the amniotic waters when infected by this bacillus. Dr. Dittel, of the same clinic, by this odor has been able in two other cases to make a preliminary diagnosis of their presence.

Kronig has obtained by sterile catheters the amniotic waters from feverish puerperal patients; in twelve out of fifteen cases anaërobic bacteria were alone present, a strictly anaërobic streptococcus being not infrequently found; twenty-one cases were examined in all, three being thus sterile.

In a case of labor which became septic after delivery the writer isolated in pure culture a strictly anaërobic streptococcus from the very bad-smelling lochial discharge a week after delivery. No other species present, either aërobically or anaërobically. It resembled the ordinary streptococcus pyogenes longus in its morphology and bouillon growth. It apparently possessed little or no pathogenic powers upon rabbits intravenously injected, and was identical with the streptococcus isolated by Kronig. Three generations were grown on glycerin and grape-sugar agar. The aërobic streak and pour-plates always remained sterile. Death four weeks after delivery with an empyema. From the exudate and lungs the ordinary streptococcus pyogenes was alone obtained in cultures made after the autopsy. One side of the cervix and uterus was converted into a suppurative phlegmon. Bacteriological examination of the pus revealed the streptococcus and a large facultative anaërobic bacillus, with colonies resembling most strikingly those of the bacillus aërogenes capsulatus.

Menge and Kronig identified the bacillus they isolated from their cases completely, and it is refreshing to observe that they were completely familiar with the original article of Welch and Nuttall as well as Fraenkel's monograph, *Ueber gas Phlegmonen.*

Lindenthal[11] (*Zur Aetiologie der sogenannter, Kolpohyperplasia cystica*) isolated an anaërobic bacillus from a case coming to autopsy, resembling that of Welch. He believes it to be the cause of the gas cysts in the vagina, which occur especially after labor. Injection of pure cultures into the cellular tissues of the vagina reproduced the lesion in guinea-

pigs. The gas production was most marked in a guinea-pig whose body had been allowed to stand a few hours before the section was made.

The bacillus, which he unnecessarily names the bacillus emphysemæ vaginæ, he believes belongs to the group or is a variety of the bacillus of malignant œdema. It, however, possesses no spores or motility, takes Gram's stain, and produces a fatal gaseous emphysema with serohemorrhagic exudate after subcutaneous injections in guinea-pigs and in mice. In rabbits a hard induration or an abscess forms after subcutaneous inoculation. Intravenous injections in only one out of a series of six rabbits were followed by death. Intra-abdominal inoculation in rabbits was negative; in guinea-pigs, two out of four succumbed from a slightly seropurulent peritonitis. Lindenthal is disinclined to consider his bacillus as identical with Welch's or Fraenkel's bacillus. The absence of capsules is not important evidence against its identity, for, although apparently familiar with Welch's work, he ignores or probably never employed his staining method. Although the writer has been able at times to stain the capsule of the bacillus aërogenes by the two methods Lindenthal employed, as a rule with these methods capsules were not demonstrable. No mention is made of his having employed the body of the dead rabbit as a culture medium or for diagnostic purposes. From the marked points of identity as described in his article, I am led to believe them to be identical.

Lindenthal[12] has reported the bacteriological examination of four cases of tympania uteri. The same bacillus was isolated. Cultures injected into the uterus after opening of the peritoneum gave rise to a condition similar to tympania uteri in guinea-pigs. He is disinclined to believe that the bacillus coli communis, in the absence of a sufficient amount of sugar, can induce the same amount of gas production in tissues. His attempt at experimental reproduction of the lesion with the colon bacillus was unsuccessful.

Welch believes that the colon bacillus is not capable of inducing the amount of gas production in the tissues which is such a marked characteristic of the bacillus aërogenes capsulatus.

In two cases in which gas was present in the tissues at autopsy, where the gas production was not due to the bacillus aërogenes capsulatus, this opinion of Welch's is borne out. In a case of traumatic seropurulent peritonitis, following a rupture of a duodenal ulcer, running a latent course, post-mortem, eighteen hours after death, the bacteriological examination of the exudate revealed the colon bacillus and the streptococcus pyogenes. Between the muscular layers of the abdominal parietes there was a moderate amount of emphysema and crackling on pressure which extended into the cellular post-peritoneal tissues. The gas bacillus was not recovered on smears from the exudate

or emphysematous tissues, and anaërobic culture, as well as inoculations into rabbits killed shortly afterward, failed to reveal it. From the emphysematous abdominal walls the colon bacillus was isolated. In a second case, a late autopsy on a case of arteriosclerosis, there was a slight emphysema of the cellular tissues over the lumbar muscles. A bacillus resembling the colon bacillus was isolated in pure culture. In both cases evidence of gas in the circulation and organs, although most carefully looked for, was missing.

To summarize briefly the cases here cited of Graham and Dalton, the local infection was followed by a systemic or ante-mortem infection. In Dobbin's case, although definite proof is lacking, little doubt can be held that such a terminal invasion of the bacilli took place. P. Ernst's case must also be held as analogous in this respect to Dobbin's. In the remaining cases cited the bacilli do not give evidence of having gained an entrance into the general circulation, or were rapidly destroyed by the bactericidal or phagocytic powers of the blood and tissues. The variety of the lesions produced by the gas bacillus after infection through the female genital tract is interesting and suggestive of the constant warfare taking place between the animal cells and fluids against micro-organisms. The pathogenic qualities of the bacillus are thus seen to be most varied.

CASE II.—*Acute Leucæmia, Terminal Infection with Bacillus Aërogenes Capsulatus.* Colored man, aged fifty years, admitted to the service of Dr. Delafield at the Roosevelt Hospital, December 17, 1896.

Personal history previous to present illness, negative. For past three months has had pains in joints of upper and lower extremities; last few weeks pain was worse. Complained also of fever, slight nausea, and vomiting. Appetite fair; constipation; insomnia.

On admission, patient is fairly well nourished; pulse fast, but of good force. The right knee is a little swollen and tender. Temperature 100°; pulse 100; respiration 26. Urine acid, 1020; trace of albumin, no sugar; microscopical examination negative. Physical examination on admission reveals subcrepitant râles over the lower part of both lungs. Apical impulse in fifth space inside nipple line. In third left space near edge of sternum there is a harsh systolic murmur and a roughening of first sound. Liver and spleen are negative.

On January 4th patient had a chill. January 5th, temperature in the morning 105°; during the next week temperature ranged between 101° and 103°. After rise of temperature on January 6th there were present signs of fluid or of consolidations over the left lung. During the whole of illness abdomen was tympanitic. Spleen is now felt four inches below costal border. Right leg also reported as swollen.

On January 8th a blood examination was made by Dr. Ewing, who reports the case to be one of spleno-myelogenous leucæmia, the leucocytes outnumbering the red blood-cells. Temperature on 9th rises to 105°. Death on January 10th. Post-mortem, 8 P. M., January 11th, twenty-four hours after death, body having been kept in a cold room.

Post-mortem notes: Subcutaneous tissues over trunk, abdomen, and

extremities crepitate. Abdominal cavity is filled with gas which ignites and burns with a blue flame. The mesenteric veins and vena cava are distended by gas; *no signs of peritonitis;* a little bloody serum in peritoneal cavity. Along the mesenteric attachment of stomach and intestines are small split-pea to almond-sized pigmented areas extending to rectum.

Heart in advanced stage of decomposition; no pericarditis or endocarditis.

Lungs slightly congested and œdematous. Bronchial lymph nodes not enlarged. Areas of broncho-pneumonia are present in both lungs.

Spleen: Weighs 26 ounces, is rather firm; follicles are much enlarged. A perisplenitis of a recent date is present. Organ is emphysematous.

Liver: Weighs 4½ pounds; surface and section smooth; color of cut section is dark and slaty; tissues riddled with gas bubbles; markings are obliterated.

Pancreas: Appears much decomposed.

Kidneys: Enlarged and emphysematous. Capsule not adherent, surface smooth and mottled, with petechiæ markings obliterated. Pelvic mucosa is infiltrated with blood.

Stomach: Petechial spots in mucosa. Inguinal and cervical and axillary glands are enlarged and deeply pigmented. Marrow of shaft of femur partly fatty and reddish in color.

Brain: Very anæmic; a few small hemorrhages in the pia mater.

Ribs are very fragile, and their marrow consists of a waxy and homogeneous substance, no red matter being present. Lingual tonsils are a little enlarged and deeply pigmented. Heart's blood watery. A few light-colored clots in right ventricle.

Anatomical Diagnosis: Acute leucœmia, hyperplastic splenitis, chronic lymphadenoma. Cultivations were made from the liver and from the contents of a loop of the small intestines, tied off at both ends at the autopsy. Smears from the liver reveal large bacilli with square ends, with capsule staining by Welch's method. A few cocci and short rods resembling the colon bacillus are also present in small numbers.

In aërobic cultures from the liver numerous colonies of the staphylococcus pyogenes aureus developed. An oval rod was also isolated, giving a whitish stab-growth, with a tendency to spread on the surface.

The anaërobic plates from the liver and intestines developed numerous typical colonies of bacillus aërogenes capsulatus.

By aërobic culture the staphylococcus pyogenes aureus and the colon bacillus were isolated from the contents of the intestine.

Animal Experimentation. A piece of the liver dropped in bouillon and left in thermostat overnight; next morning bouillon is black, and much gas is present around the piece of liver. Cover-glass preparation shows numerous capsulated large bacilli and cocci.

A large, healthy pig was injected subcutaneously in abdomen with 2 c.c. of this bouillon; next morning a large, fluctuating swelling, which, on tapping, emits a splashing sound, is present over abdomen. Crepitation is marked. Death twenty-four hours after injection. Autopsy performed just after death; hair over abdomen epilates easily. Subcutaneous tissues are necrotic and are lifted up from the muscles, necrotic strands of tissue still connecting the layers. These spaces are filled with a slightly hemorrhagic fluid and with gas which escapes. The

necrosis extends over whole of front of abdomen and thorax. The odor of the fluid is sweet, but not disagreeable. Abdominal and thoracic muscles are covered with a white pasty necrotic mass. A few ecchymotic spots under the peritoneum. Intestinal vessels are injected and distended. Suprarenals slightly enlarged. In the lungs a few hemorrhagic areas. Kidneys, liver, and spleen appear normal. Heart cavities are filled with dark, fluid blood. Cultures, anaërobic and aërobic, from heart's blood remain sterile; cover-slips reveal no bacteria. The subcutaneous tissue cover-slips show numerous large capsulated rods. Cocci and also oval rods or cocci in chains, which were seen previously in the liver-smears, are present. The anaërobic plates from the subcutaneous tissues show typical colonies and gas-bubbles.

Injections of the Bloody Exudate. 2 c.c. of the hemorrhagic fluid of the gaseous phlegmon, injected subcutaneously in a guinea-pig (No. 2), caused death in eighteen hours; a fluctuating swelling formed over whole of abdomen and thorax. Section four hours after death reveals extensive necrosis of the muscles of abdomen and thorax, with a hemorrhagic œdema in the dependent portions. A clear and slightly hemorrhagic fluid is present in the peritoneal cavity. Cover-slips of this fluid and from the fluid of the phlegmon, several numerous capsulated bacilli, a few smaller rods and cocci. Intestinal vessels are deeply injected. Spleen not enlarged, and shows small, whitish spots. Smears from the liver reveal numerous capsulated rods. By anaërobic culture the bacilli are recovered from the heart's blood, liver, and phlegmon; by aërobic culture, the staphylococcus pyogenes albus.

2 c.c. of the hemorrhagic fluid of pig 2 inoculated in pig 3 caused a gaseous phlegmon, with death in forty-eight hours. Similar post-mortem appearances. Smears from the phlegmon reveal several large capsulated bacilli and numerous cocci.

2 c.c. of the hemorrhagic fluid of pig 3 injected subcutaneously in pig 4. Next morning a hard swelling, size of a large walnut, has formed at site of the inoculation. Death in thirty-six to forty hours.

Pig 6 receives 1.5 c.c. of the hemorrhagic fluid of pig 4. A hard swelling forms at site of inoculation, death occurring in four days. Little hemorrhagic fluid is present.

These successive inoculations from pig to pig were employed with the view of increasing the virulence of the bacillus and to obtain the toxins either by filtration of the hemorrhagic fluid contained in the phlegmon or in artificial cultures after inoculation by bacilli of a higher degree of virulence. We were not successful, because the quantity of hemorrhagic fluid decreased from animal to animal. We were also never dealing with pure cultures, but the series was continued, as it seemed the easiest way to keep the bacilli virulent and alive.

Inoculation of Pure Cultures. Pig 5 received the whole of a forty-eight-hours' growth in a stab-agar tube, showing marked development of gas. Animal develops a gaseous phlegmon, which, later, becomes hard and breaks externally. An extensive area of suppuration is formed, extending over the dependent portion of abdomen and thorax. Cicatrization completed two weeks later. Animal dies later from marasmus.

Second Series of Inoculations from Animal to Animal. Pig 7 received 2 c.c. of an emulsion in sterilized salt solution of an actively-growing

forty-eight hours' old culture, representing a third generation from the liver, in a sugar-agar stab. Gaseous phlegmon develops promptly; lives nineteen and one-half hours. Autopsy held at once after death. Much hemorrhagic fluid has collected between the skin and muscular layers in a sac occupying the whole of the thorax and abdomen. Axillary and inguinal lymph-nodes are reddened and hemorrhagic. The muscles of abdomen and thorax are intensely congested, the whitish necrosis here being confined to site of inoculation and of limited extent. Some clear fluid in peritoneum; spleen not enlarged; kidneys appear swollen; urinary and gall-bladders are distended. Liver somewhat enlarged; lungs normal; both chambers of heart in diastole and filled with dark, fluid blood. Pericardium contains clear fluid. Hair of abdomen epilates easily. Both horns of uterus contain two fœtuses. Hanging-drop from subcutaneous fluid shows enormous numbers of large rods which are *non-motile*. These rods show very slight Brownian movement.

Cultures. All anaërobic plates on sugar-agar allowed to grow three days before being examined. The subcutaneous plates reveal typical growth in original and in both dilutions.

Urine. Original shows typical superficial and deep colonies controlled by smears. *Bile* and blood of heart, sterile. *Spleen* plate sterile, but a melted sugar tube at 40° shows a few large colonies at bottom of tube. *Kidney* plate sterile; a stab-tube reveals a growth, however. *Liver* plate, numerous colonies and large gas bubbles. Presents a pure culture. A smear from the subcutaneous fluid reveals capsulated rods, and chains of short but thick rods are numerous. Smears from pericardial fluid and from heart's blood, spleen, and liver negative. In peritoneal fluid a few capsulated rods. Plates on plain agar from the heart's blood, after three days at 37° C., remain sterile.

Pig 8 inoculated with 0.5 c.c. of same emulsion that pig 7 received on 23d at 4 P.M. Died during morning of 25th. Autopsy about eight hours after death. The skin of abdomen is raised by a soft fluctuating swelling, which is readily movable; in places crepitation is made out. Gas in swelling ignites with a bluish flame and detonates slightly. Epilation of hair does not readily take place as in pig 7. Rosy-colored fluid and necrosis are present. Pericardium and peritoneum contain a little clear fluid. Adrenals are not hemorrhagic. Spleen slightly enlarged; Malpighian bodies are more prominent than usual. Heart dilated, dark, fluid blood in both chambers.

Cultures. Plain agar plates grown aërobically, after five days at 37° C., from the subcutaneous tissue, the blood of the right heart, the liver, kidney, urine, and spleen, remain sterile.

Anaërobic cultures on sugar-agar; all plates allowed three days of growth at 37° C. Bile and urine sterile. Liver plate sterile; a stab, however, shows growth. Kidney and spleen plates develop typical colonies with gas bubbles. Right heart plate sterile; stab from both auricles shows growth, smears revealing typical rods. Subcutaneous tissue overcrowded; original growth in both dilution plates. Peritoneum, a characteristic stab growth in sugar-agar in pure culture.

Pig 9. 25th, 2 P.M., received 1.5 c.c. of subcutaneous hemorrhagic fluid of pig 8. Next morning animal appears well, but has quite an extensive collection of fluid on one side, near site of inoculation, which moves on pressure, and on tilting abdomen a gas bubble is seen to move

upward and downward; over site of bag of fluid superficial layers of epidermis and hair have peeled off. Died morning of 27th. Section 12 M., 27th, body during morning being kept in cold storage. Post-mortem appearances similar to those above described. Aërobic cultures of kidney, liver, and right heart's blood are sterile. Spleen plate is badly contaminated, also the plates from the subcutaneous fluid. Anaërobic culture; blood from right heart sterile. Spleen plate, numerous colonies of bacteria. The hemorrhagic fluid, original, and first dilution plate show a pure culture of the bacillus aërogenes capsulatus. Smears from peritoneum reveal a few capsulated rods; from the hemorrhagic fluid, large rods alone. The bile, liver, kidney, and amniotic fluid are sterile. A stab in sugar-agar from left heart shows in a pure culture. Urine plate contains twenty-five colonies in pure culture.

Pig 10. Injected subcutaneously, at 3 P.M., 27th, with 1 c.c. of the slightly-turbid hemorrhagic fluid of pig 9. Weight, 402 grs. Soft, movable swelling, with gas and crepitation, is soon felt. Found dead at 8 A.M., 28th. Weight, 413 grs. Section three hours later; some extensive undermining of the tissues. Slight amount of fluid in pericardial and peritoneal cavities. Heart filled with dark, clotted blood. Lung shows a few hemorrhagic areas. Liver and kidney normal. Left adrenal blackish, almost no cortex being visible. Spleen normal. Uterus contains four small fœtuses.

The aërobic cultures were contaminated from unsterilized plates.

Anaërobic culture: Kidney, spleen, and liver plates were sterile.

Bile, urine, and blood of right heart reveal a growth. Subcutaneous tissue, typical rods, but also other smaller rods have grown.

Rabbit 1. 1.5 c.c. of the hemorrhagic fluid of pig 10 injected intravenously at 11 A.M., 28th. At 1 P.M. rabbit was lying on its belly; does not rise on poking it. 3.15 P.M., found dead; abdomen then hard and swollen. Two and a half hours later crepitation is felt over whole surface of body. The frothy, blood-tinged fluid oozing from nostrils contains, at this time, large capsulated bacilli. Body, kept at room temperature overnight, is found tremendously swollen. All the organs markedly emphysematous. Blood and tissue fluids contain enormous numbers of rods.

1.5 c.c. of the hemorrhagic fluid of pig 10 injected subcutaneously in abdomen at 11.30 A.M., 28th, into pig 11; found dead at 8 A.M., 29th. Crepitation over swelling is present. At one place the muscular layer has been thinned, so that an opening between the peritoneum and the phlegmon may exist. Intestines and stomach show intense injection of their vessels; reddish fluid is present in the peritoneum, but no whitish exudate. Organs normal in appearance.

Anaërobic culture: Three days' growth at 37° C. Right heart and kidney are sterile. Liver shows overcrowded colonies, a pure culture apparently. Urine, numerous typical colonies develop. Aërobic plates from the liver are overgrown with a bacillus resembling the colon bacillus.

The subcutaneous plates, aërobic and anaërobic, are overgrown by a greenish growth. A smear of peritoneal fluid reveals numerous typical rods recovered by culture, also oval cocci and a few thinner rods.

Rabbit 2. Injected intravenously with 0.2 c.c. of the peritoneal fluid of pig 11, at 1.15 P.M., 29th. Several hours later animal is quiet. Found dead next morning. The body is much swollen, and crepitation

is everywhere present. Emphysema of all organs and vessels. Peritoneum distended with gas, burning with a bluish flame.

A Third Generation in Sugar-agar Thirteen Days Old. 1.5 c.c. of an emulsion in sterilized salt solution of a culture containing the bacilli in enormous numbers was injected subcutaneously in each of two pigs. Pigs reactionless. Bacilli stained well and gave a growth on transplanting.

Other attempts to produce, with pure cultures, an emphysema in guinea-pigs were made, with negative results.

In this case terminal infection with the bacillus aërogenes capsulatus seems probable. The abdominal symptoms, pain, tenderness, and tympanites, which became very marked several days before death of the patient, made the diagnosis of peritonitis a probable one, and this diagnosis was entertained, although no cause could be assigned for it; but no peritonitis existed. Emphysema of the subcutaneous tissues, *intra vitam*, was not observed, but no especial attention was paid to this point.

Sections of the liver show larger and smaller gas-holes which are empty. The bacilli are collected around the periphery of these cavities. Evidences of compression of the liver cells surrounding the gas-holes are present. These cells are converted into a mass of badly-staining protoplasm, the outlines of the individual cells being only occasionally made out. Nuclear staining is absent. Where the cells are not so badly disturbed there is vacuolation.

The masses of bacilli are situated mostly in the central veins, and evidence of gas is not always seen. The cells surrounding these bacterial masses show the same loss of nuclear staining and vacuolation. In places the portal vessels contain bacilli. The characteristic large bacilli, staining beautifully by Weigert's method and also by hæmatoxylin, were alone noticed. In the capillaries between the liver cells are seen a few isolated bacilli; toward the periphery of the bacterial emboli they are more numerous. Some of the large hepatic veins contain fibrinous clots or thrombi, with but few bacilli.

The whitish areas of necrosis, with small central gas-holes observed and described by Ernst in one of his cases, were carefully looked for in the liver, macroscopically, but were not present. In the first case of Ernst the autopsy was made three hours after death, and it seems not unlikely that had our case come to autopsy at so early a time similar appearances might have been noted. The change described above in the liver cells, the areas of necrosis surrounding the bacterial growths, in our case never extending quite the whole breadth of an acinus, have been considered by Ernst and by Welch and Nuttall as indicative of a vital process produced by the toxic products of the growth of the bacilli. The liver was also the seat of a marked congestion of the capillaries. It seems most probable that the bacilli gained entrance into the portal circulation through the intestinal coats, which, perhaps, were

impaired by a venous congestion, and found in the slow circulation of the mesenteric and hepatic veins a suitable soil for development, giving rise to the abdominal symptoms. The presence of thrombi in the hepatic veins would have favored their growth, the blood in the portal circulation being thus more than ever poorly oxygenized.

The tissues of the small intestines are necrotic, everywhere invaded by myriads of bacilli, and have undergone so much post-mortem change that a further examination was valueless. The kidneys in places are the seat of a marked leucæmic infiltration. The bacilli are in masses inside the bloodvessels and in the tufts. A few casts and bacterial masses are present in the collecting tubules. The parenchyma around most of these bacterial plugs appears unaffected, but in places there is for a considerable distance a loss of nuclear staining. No vacuolation is present. Otherwise the kidney presents the appearance of a parenchymatous degeneration. The spleen shows evidences of compression and necrosis in the cells around the gas-holes. Similar areas are present in the vicinity of the bacterial plugs.

The absence of cocci in the sections of the liver, and their presence by culture in the contents of the small intestines, lead to the opinion that the cocci gained entrance to the liver after death.

Without wishing to lay special stress on the point, it is interesting to note that Dr. Ewing, in examining the blood smears stained by eosin and methylene-blue, prepared three days before death, found a few large bacilli. It is to be regretted that no cultures were made of the blood during life.

Similar Cases of Suspected Terminal Infection. In July, 1895, Goebel,[13] in an article "Ueber den Bacillus der Schaumorgane," confirmed the work of Welch and Nuttall, and identified his bacillus with the bacillus phlegmones emphysematosæ of Fraenkel. He also comes to the conclusion that in two of his cases there was a terminal infection.

The first case was one of pyelonephritis consecutive to papilloma of the bladder and abscesses of the prostate and seminal vessels. Gas-blebs were found in the heart muscles, liver, spleen, adrenals, and stomach.

Around many of the blebs in the heart and liver the cells were necrotic. In the spleen necroses were not present around the gas-blebs. The lesions in the liver were nearly similar to those described by Ernst in the livers of one of his cases. He concludes that the disappearance of the nuclei and degenerative changes around the masses of bacilli point to a vital process and not merely to a post-mortem change. The portal of entry, he concludes, on account of the frequent catheterization before death, to be the genito-urinary tract.

The second case was one of enlarged prostate in a man, aged sixty-six years. Frequent catheterization was necessary. The post-mortem

diagnosis was emphysema pulmonum, pneumonia lobularis, embolia art. pulm. lob. inf. sin., and arteriosclerosis universalis. Numerous gas-blebs were found beneath the mucous membrane of the urinary bladder. Necroses were absent from the walls of these blebs. Capsules were demonstrated in smears from the gas-blebs of the bladder. In cultures these capsules were absent, except in one instance. He holds that the invasion in the bladder-walls was a post-mortem phenomenon, on account of the absence of the vital changes in the bladder above described.

The third case was one of pyæmia following endophlebitis of the cutaneous veins of the left foot. Beneath the gastric and intestinal mucosa were gas-blebs resembling those in the preceding case, except that necroses were present around the blebs. The intestine he considers to be the portal of entry for the bacilli. Evidences of gas were absent, except in one of the femoral arteries. The experiments of Welch and Nuttall were repeated with identical results both with the bacillus isolated from foaming organs and with that from gaseous phlegmons. Necroses were absent from the walls of gas-holes developing in the organs of dead rabbits. Spores were present in one culture, a stab forty-eight hours old, in a sodium formate agar-tube. Liquefaction of gelatin with cultures from Case I. was slow and limited; with those from the second it was rapid and marked. Subcutaneous inoculation of guinea-pigs was followed by fatal gaseous phlegmons.

Case III.—*Hypertrophic Cirrhosis.* Dr. Norrie, assistant physician; Dr. McClellan, house physician. Patient, aged fifty years; admitted February 6, 1897; died February 7, 1897.

Personal History. Markedly alcoholic. Patient was well up to two months ago, when he began to complain of pain in right side. For past three weeks has had dyspnœa and insomnia. Three days ago suddenly began to vomit large amounts of clotted blood. Blood in stools. Œdema of feet the last four days. Apex in fifth space inside of nipple line; action rapid and regular. Systolic murmur in third and fourth space close to border of sternum. Lungs negative. Liver, from fifth rib to free border, edge not felt. Abdomen large; superficial veins are prominent; abdomen tympanitic. Pulse rapid, regular, and of good force. No tension. On day of admission said to have had bloody expectoration; vomited a few ounces of blood. Patient became weaker, delirious, and died with signs of œdema of lungs. Urine was bile tinged, otherwise negative.

Post-mortem by Dr. Norrie, twenty-seven hours after death. Large frame, adipose abundant. Rigor mortis is present. All the subcutaneous tissues are tremendously inflated with gas, which escapes and burns with a bluish flame. Foul odor. A number of discolored blebs filled with serum are situated on the thighs and trunk. Face is much swollen and discolored. Gas and blood bubble out of mouth. Scrotum much swollen with gas. Heart weighs sixteen and one-half ounces and is dilated; valves normal. Post-mortem change very marked. Both lungs are congested.

Liver weighs six and one-quarter pounds; its surface is rough, and

consistency very firm. On section, lobules stand out prominently. The liver is fatty and cirrhotic. Bubbles of gas escape on section. Spleen about eight inches in length, very soft. Kidneys show marked post-mortem change. Stomach filled with clotted blood. Mucous membrane is much congested.

Anatomical diagnosis: hypertrophic cirrhosis of liver; dilatation of heart

At the laboratory liver was found to be large and firm, and of a blackish-green color; crepitation on pressure, and on standing at room temperature crackling is heard.

Cultures were made from the liver and from a loop of small intestine tied off at the ends during the autopsy. Cover-slips from liver show the characteristic large rods, with well marked capsules, staining by Welch's method and by nearly all, except Gram's, stains. Diplococci more or less lancet-shaped and staining by Gram's stain, also thinner rods negative to Gram are seen, and large coccus or oval forms in chains positive to Gram. Smears from the intestinal contents show large capsulated rods in great abundance. Shadows are also seen which do not stain, except along a narrow edge. The vast majority of the bacilli present can be identified as the bacillus aërogenes capsulatus.

A piece of liver was crushed up in salt solution in a test-tube; 1.5 c.c. of this solution was inoculated intravenously in a rabbit, and the same amount subcutaneously in a pig; next day the pig had developed a hard, elongated swelling over front of abdomen, extending well up over chest. Three days after inoculation the skin over the swelling had ruptured. Animal does not appear sick, and eats well. After eight days cicatrization is present, but the wound exudes still a little bloody fluid. Animal recovers.

The rabbit, a few hours after injection, appears quiet. Twenty-four hours later the animal is killed, and the body is left overnight at room temperature. Crepitation next day is apparently felt. The body is then placed three hours at 37° C. On section no gas was present. Cover-slip from peritoneum and blood reveals rods resembling the colon bacillus. No cultures made. Post-mortem softening is marked. In this case twenty-four hours' sojourn in the circulation of the rabbit was sufficiently long to kill the bacilli.

Aërobic plates on plain agar from the liver. Original is overcrowded with colonies, apparently of one kind. First dilution plate shows colonies of one kind, resembling the pneumococcus. Deep colonies are grayish-white; under lower power are nearly black. Surface colonies have a light-bluish color and are nearly transparent. Under lower power are granular, the centres being dark and edge beaded. Smears from numerous colonies reveal a coccus positive to Gram, mostly in chains, many distinctly lancet-shaped. Size of cocci varies slightly. Bouillon inoculated from these colonies gives a whitish sediment and a slight diffuse cloudiness. Milk coagulates between forty-eight and seventy-two hours. Stab-gelatin tube shows a growth after three days, consisting of small, isolated, and whitish colonies. No surface growth and no liquefaction after fifteen days. Smears reveal streptococci and diplococci. A mouse inoculated intraperitoneally with an emulsion of salt solution from numerous colonies on original plate shows no reaction, and lives.

The streptococcus was identified as one of those forms which cloud bouillon.

The anaërobic plates on sugar-agar from the liver; original is overcrowded with small colonies, dark in color, with characteristic branching projections, and gas develops on second day. Smears reveal threads and long rods, the short, thick rods observed in the liver smears not being present.

By aërobic culture from the contents of the intestines were isolated the colon bacillus and a diplococcus resembling that recovered from the liver.

The anaërobic plates, the original, develop colonies of the bacillus aërogenes capsulatus and the bacillus coli communis. The second dilution plate presents a pure culture of the former.

The portal of entry for the bacilli in this case would seem, although this is not susceptible of definite proof, to have been the intestinal tract, probably a post-mortem invasion through the patulous and ruptured œsophageal veins.

Animal Inoculations. Pig 1 inoculated subcutaneously with 1.5 c.c. of a turbid bouillon culture, grown anaërobically for four days, develops a few hours later a soft, fluctuating swelling, which is tender to the touch and crepitates. Death in thirty-six hours. Typical post-mortem appearances. Cultures were made several hours after death. The aërobic cultures on plain agar from all the organs and from the fluid of the phlegmon are sterile. The gas bacillus was obtained by culture from the blood of the left heart, peritoneum, urine, and the hemorrhagic fluid. Right heart, liver, kidney, and the gall-bladder sterile.

Pig 2. Inoculated with a like amount of same culture, develops a gaseous phlegmon which breaks externally. The swelling is surrounded by a hard induration which extends over part of thorax. Animal slowly recovers.

Pig 3. 1.5 c.c. of the slightly-hemorrhagic fluid from pig 1 was injected subcutaneously in pig 3; several hours later a small swelling, freely crepitating, has formed, which rapidly enlarges and becomes soft and fluctuating. Death in less than forty hours. Same post-mortem appearances. Hemorrhagic fluid does not present a pure culture, cocci being seen on the smears. Autopsy several hours after death. Anaërobic cultures from the urine, hemorrhagic fluid, and peritoneum alone show a growth of the gas bacillus, the organs and heart's blood being sterile.

Aërobic plates from the spleen, liver, kidney, and right heart's blood are sterile.

The aërobic plates of the hemorrhagic fluid contain numerous colonies resembling those of the colon bacillus. In making inoculations to determine the cultural characteristics of this bacillus it was observed that a milk-tube, grown aërobically, presented after forty-eight hours a firm clot floating on the surface of a clear serum, and it emits a strong smell of stale glue. Smears reveal large capsulated rods, also rods resembling those taken from the colony. A second milk-tube inoculated from this milk-tube revealed a similar appearance after forty-eight hours' growth. Typical colonies developed by anaërobic cultivation. Inoculation from these colonies refused to grow aërobically. This occurrence shows the ability of the anaërobic bacillus to grow under aërobic conditions in the presence of anaërobic bacilli belonging to the colon group. In fishing the aërobic colony a few rods, which

were present in the media, were carried over into the milk-tube with the aërobic bacilli.

Rabbit 1. 1.5 c.c. of the hemorrhagic fluid from subcutaneous tissue of pig 1 was injected intravenously. Half an hour later rabbit dies suddenly with violent clonic convulsions. Soon after death abdomen becomes hard and tense. Crepitation develops after a few hours in the subcutaneous tissues, and the bloody froth oozing from nostrils contains the bacilli four hours after death. Next morning body is still more swollen. All organs and tissues are riddled with gas bubbles. Smears reveal large rods with capsules staining by Welch's and by Luepke's method. No cultures were made. Body floats lightly on surface of water. Death was probably due to embolism.

Rabbit 2. A large buck-rabbit receives intravenously, at 2.45 P.M., 1.5 c.c. of same bouillon culture which was used to inoculate pigs 1 and 2. Temperature 102.2°. No effect noticed. Animal remains alive.

Rabbit 3. Receives a like amount of the same bouillon culture; killed at once and left at room temperature. Body becomes swollen in a few hours. Next morning body is tympanitic, gas present everywhere. Gas ignites with a slight report and a bluish flame.

50 c.c. of gas contained in the peritoneal cavity collected and, by analysis, is found to consist principally of HCO_2 and small traces of CH_4.

Pig 4. 0.3 c.c. of the hemorrhagic fluid of pig 3 injected in subcutaneous tissue of abdomen of pig 4 causes a swelling which shows fluctuation and crepitation. Death six days later. Skin has nearly broken through centre of the swelling, the edges of which are infiltrated and hard. Section a few hours after death; anaërobic culture of blood, urine, and organs fails to reveal the gas bacilli. The aërobic bacilli present in the hemorrhagic fluid injected are recovered by culture in all the organs, bile, blood, and hemorrhagic fluid.

The Effect of the Toxins developed in Artificial Culture of the Bacillus Aërogenes Capsulatus. To determine the character and amount of toxins produced in artificial culture media, a half-litre of 2 per cent. grape-sugar bouillon was inoculated from one of the colonies on the anaërobic plates from the intestine. The flask placed for two weeks at 37° C. in an anaërobic jar. Cloudiness of bouillon after twenty-four hours, fluid becoming clear after four days, and there is formed a considerable whitish sediment. Supernatant fluid was decanted off and filtered through porcelain filters by Dr. Prudden.

A large hare, weighing 2130 grs., received intravenously 8 c.c. of this fluid, warmed to a temperature of 37° C., 2 c.c. being injected at intervals of five minutes. After injection, respirations are labored and hurried.

Temperature per rectum before inoculation 102.8° F. Temperature per rectum three-quarters of an hour later 103.4° F. Animal quiet. Ears cold. Three hours after injection, temperature 104.6° F. Four and one-twelfth hours after injection, temperature 103.1° F. Twenty-three hours after injection, 102° F. Ears warm. Weight 2080 grs. Little effect was thus noted.

White rabbit; weight, 1848 grs. 13 c.c. at 37° C. were injected intravenously, fluid being at body temperature. Temperature before inoculation, 101.8° F. One hour later, temperature 103.5° F. Ears

warm. Animal apparently unaffected. Fifty hours after injection, temperature 100.8° F.; ears and body warm. Rabbit appears sick, but remains alive.

Guinea-pigs. A guinea-pig receives 6 c.c. of the filtered toxin subcutaneously. Temperature before injection 101.2° F.; one hour later, 96.8° F. Hair of shoulders and neck stands erect, abdomen is tender to the touch, and the animal lies on its side, trembles, and strokes mouth with its paws. Temperature three hours after injection 100.7° F., and the pig is still shaking. Twenty hours later, entirely recovered; temperature 101.9° F.

A second pig receives intraperitoneally 12 c.c. Before inoculation, temperature 101.8° F.; one hour later, temperature 95.4° F. Animal is very sick and weak, and lies on its side. Hair of shoulders and neck erect, violent shaking. After three hours, temperature 96.8° F. Animal shaking violently. Twenty hours after injection, temperature 102.8° F. Animal has recovered entirely.

These experiments show that the filtered bouillon has a marked toxic action on guinea-pigs, but that little toxic action is apparent after intravenous inoculations in rabbits.

The Effect Produced by Dead Bacilli. To determine the effect of the dead bacilli, the whitish sediment on the bottom of the flask was treated with sterilized normal salt solution, sterilized for half an hour at a time in an Arnold sterilizer for two days in succession; the sediment then failed to give a growth, by anaërobic or aërobic culture. Smears from this sediment gave characteristic rods, about one-half of the bacilli accepting Gram's stain, the other half decolorizing. The sediment was allowed to settle and was washed three times, the fluid being decanted each time.

Subcutaneous injections in guinea-pigs and rabbits were followed by no local effects; intramuscular injections also were negative. These results are in harmony with those obtained by Eug. Fraenkel.

CASE IV.—*Gaseous Phlegmon Following a Compound Fracture of the Right Tibia at its Upper Third.* This case occurred in the service of Dr. Bryant at St. Vincent's Hospital, to whom I am indebted for the permission to publish the case.

On December 17, 1896, the patient, a driver, slipped on the snow, and the wheel of the truck passed over his right leg. He was brought to the hospital in an ambulance. The leg was greatly swollen, ecchymotic, and gave signs of air under the skin just below tuberosity of the tibia. A compound comminuted fracture of the tibia was made out, and from the small wound venous blood continued to escape, even after pressure above had been applied. The thigh just above the knee was badly contused, and the knee-joint seemed to be full of fluid and air. Patient was in a condition of shock, and the foot was cold. Leg shaved at the wound, thoroughly irrigated with bichloride solution, dressed, and splints were applied. Elevation of leg and free stimulation.

18*th.* Considerable discharge of dark blood in the dressing. Temperature 101°; respiration 24; pulse 104 at 1 A.M. Temperature 104°; respiration 29; pulse 112 at 9 A.M.

19*th.* Temperature 104.6°. Leg greatly swollen, and several incisions were made, letting out a quantity of dark, offensively-smelling blood. Thorough irrigation with 1 : 100 carbolic solution, hot carbolic dressings being applied. At 1 P.M. temperature 106°; pulse rapid and weak.

Sponge baths to reduce the temperature, which went to 104.8° in half an hour. Under anæsthesia a few incisions in leg and thigh were made, from which a little blood and some gas escaped. Skin seemed to be filled with gas, little fluid or œdema being present. Drainage-tubes inserted, elevation of foot, and hot carbolic dressings. Free stimulation. Tissues around fractures were gangrenous and circulation in foot was poor.

22*d*. Patient's condition noted as improved. Several incisions were made in gangrenous part of leg, below the fracture, and continuous irrigation of carbolic solution was allowed to play on the leg. Patient restless and delirious.

23*d*. Amputation of leg at lower third of femur, anterior and posterior skin flaps being made. Little hemorrhage occurred. Marked weakness after operation. Circulation in leg was so feeble that the flaps were not sutured. The posterior flap was ecchymotic and nearly bloodless.

Temperature after operation 101.6°; respiration 18; pulse 118. Very restless and complained of intense pain at intervals.

24*th*. Delirious. Dressed twice daily.

26*th*. Takes nourishment and medicines. Wound filled with sloughy tissues and contains little or no blood.

28*th*. Died suddenly in the morning.

Temperature steadily rose from time of accident to its highest point —106° F., 1 A.M., December 19th. Course of temperature varied then approximately between 102° to 104° with diurnal variations.

Through the kindness of Dr. W. C. Lusk I was enabled to make the bedside cultivations, four days after the injury and a week before death of patient.

December 21, 1896, deep stabs in sugar-agar and a slant of glycerin-agar were made; the latter, grown aërobically, develops a pure culture of the staphylococcus pyogenes albus. The smears made at the bedside reveal cocci, not in great abundance, and longer and shorter thick rods with rounded ends staining positively to Gram.

The bacilli by Welch's method reveal beautifully stained capsules; by Loeffler's stain they appear somewhat granular.

Two of the four deep stabs gave a vigorous growth with marked gas production along length of the puncture, which is slightly yellowish in color, edges are fluted, and have dark granular spots. Smears reveal large bacilli with rounded ends. Chains of a dozen members are numerous, and also thinner rods of considerable length. Capsules were not demonstrable. No cocci seen on the smears. Four plates develop pure cultures of the bacillus aërogenes capsulatus. As the colonies resembled in every detail those seen in previous cases from organs, a description is superfluous. From some of the colonies smears revealed threads of various lengths more or less bent. These threads were never seen in previous cases, but resemble the threads obtained from the gaseous phlegmons of guinea-pigs. In smears made from some of these colonies capsules were demonstrable. The rods are absolutely immotile.

An emulsion in broth from one of the original stabs injected into a rabbit intravenously. Killed after a few minutes and body kept at 37° C. for twenty-four hours. Body is found much swollen; crepitation and gas are present in all organs, vessels, and subcutaneous tissues.

Smears made from different places reveal capsulated bacilli. The colonies on the pour plates refused to grow further on transplanting.

Remarks on Similar Cases. It would extend the limits of this report to go into the literature of gaseous phlegmons, especially those cases in which the colon group has been isolated. A review of Fraenkel's[2] cases has been furnished by Welch and Flexner. Erdman[14] has reviewed and brought together the cases in which the bacillus aërogenes capsulatus was isolated from gaseous phlegmons, but does not include Fraenkel's four cases.

Fraenkel's bacillus corresponds closely with the bacillus isolated in my cases. Fraenkel's cultures at room temperature died in two or three days. He noticed a marked difference in the amount of fermentation, even in media made in the same way. Two per cent. agar interferes with the gas formation. Age of culture does not interfere with the gas production when planted on fresh media. In other cases, with daily inoculations, no gas was formed, a fact also observed by myself. In my experience the older the generation the less was gas produced. Contrary to Fraenkel, my sugar-agar cultures were the ones to develop most smell, and hydrogen sulphide was never formed. Slant blood-serum he recommends as an excellent medium. He did not observe spore formation on this medium, but mentions that he has found spores inconstantly on sodium formate. Gas and fetid decomposition of the serum were produced. Curiously enough, he finds nothing characteristic in the coagulation of milk, gas production being absent. After twelve weeks he was able to reinoculate from a gelatin-stab kept in room temperature, which has remained intact, and he claims that the virulence when tried on suitable media does not diminish.

As regards animals, the pig was the most sensitive. With mice no result. Intravenous injections in rabbits were negative. Subcutaneous injections in rabbits were not regularly attended with local lesions; the lesion produced is different from that observed in man. A rabbit received a twenty-four-hour-old agar culture. Next day there is formed at site of the inoculation an œdematous swelling. After forty-eight hours' swelling is tense and gives pseudo-fluctuation. The general condition of the rabbit unimpaired. Necrosis of skin over swelling occurs slowly and leaves a crater-like excavation, the edges of which are covered with a grayish necrotic tissue. Healing occurs with formation of scar tissue after weeks. Skin in neighborhood of abscess remains hairless. With pure culture no suppuration was ever present. In experiments in which the gas bacilli were injected in combination with streptococci and staphylococcus pyogenes aureus, softening of the muscles always occurs.

In animals the bacilli were never found in the organs, nor any changes microscopically. Dead bacilli, he says, do not protect or cause any local

changes of the tissues in pigs, nor does one affection protect from another.

CASE V.—Through the kindness of Dr. Dunham the writer was enabled to make cultivations from another case of "Schaumorgane," reported by him in the *Bulletin of Johns Hopkins Hospital.* The same bacillus was isolated, producing in pure culture, in the bodies of dead rabbits, identical post-mortem appearances. Subcutaneous inoculations in guinea-pigs were not made.

CASE VI.—This case forms the subject of a report by Dr. Larkin[15] read before the New York Pathological Society. It was a case of hemorrhagic pancreatitis with multiple hepatic abscesses. Gas-holes were especially marked in the left lobe of the liver. Post-mortem eight hours after death. From the liver the bacillus aërogenes capsulatus was isolated.

To conclude, pure cultures injected in guinea-pigs subcutaneously often fail to produce any local effects. Only the most actively growing fresh cultures produced a fatal gaseous phlegmon. When the phlegmon breaks externally, the animal usually survives. Sections of the abdominal wall taken from the affected areas show that the process is one of necrosis principally. In no case was there any evidence of suppuration where pure cultures had been employed. The hemorrhagic fluid contains few leucocytes. The organs showed no marked microscopic lesions.

Injections of the hemorrhagic fluid of guinea-pigs into other guinea-pigs produced fatal phlegmons with regularity. Production of gas at site of injection was not infrequently seen in less than an hour after inoculation. Intravenous inoculations of pure cultures (in rabbits) were never followed by any effects. Intravenous injections in rabbits of the hemorrhagic fluid were usually followed by fatal results. As small amounts were injected, it is hard to believe that the fatal results could be attributed to the toxic effect of the serum, *per se.* It seems likely that the bacilli are able to produce much larger amounts of toxin in the body fluids, and to attain here a higher degree of virulence, than in artificial culture media. This conclusion seems justified, as pure cultures are much less virulent than the hemorrhagic fluid of guinea-pigs when injected into other guinea-pigs.

Attempts at filtering the hemorrhagic fluid were unsuccessful, the filters becoming clogged before more than a few drops had run through.

C. Fraenkel found that guinea-pigs which had recovered from the effects of previous gaseous phlegmons, on reinoculation succumbed as quickly as fresh guinea-pigs. The hope, therefore, of finding a protective serum seems not as yet justified.

The bacillus seems to be most widely distributed; but no one has, as far as my knowledge extends, undertaken to find out how often it is

present in the intestinal tract, and it has not been found in nature. It has been assigned as the cause of peritonitis, being found in pure culture in the exudate in one of Welch and Flexner's cases. The cases of experimental peritonitis that have been produced by others were characterized by a similar exudate to that described by Welch and Flexner to be present in their case.

The writer cannot help expressing his lively anticipatory interest in the conclusion of the article of Welch and Flexner, which has yet to appear. There are many points referred to by the authors which have not as yet been elucidated.

In conclusion, I wish to express my deep sense of obligation to Dr. Prudden for his kind help and advice, which have always been at my service.

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REVIEWS.

1. An American Text-Book of the Diseases of Children. By American Teachers. Edited by Louis Starr, M.D., assisted by Thompson S. Westcott, M.D. Second edition, revised. Philadelphia: W. B. Saunders, 1898.

2. Medical Diseases of Infancy and Childhood. By Dawson Williams, M.D., Physician to the East London Hospital for Children. In one 12mo. volume of 629 pages, with 18 illustrations. Philadelphia and New York: Lea Brothers & Co., 1898.

3. Traité de l'Allaitement et de l'Alimentation des Enfants du Premier Age. Par le Dr. A. B. Marfan. Paris: G. Steinheil, 1899.
(Treatise on Nursing and Feeding of Infants. By A. B. Marfan, M.D.)

The discussion of diseases of childhood is frequently based upon knowledge gained in the study of diseases of adults. This is manifestly improper, and the tendency of the day is, as it should be, toward a general recognition of the independent position of pediatrics. Authors who presume to write text-books or articles on diseases of children should base their observations upon facts learned in the study of the diseases of childhood, and not upon their general medical knowledge, with supplementation of statistical tables showing the frequency of diseases under discussion in early life. In some of the older text-books the omission of such occasional statistics would have justified a change of the title-page from "Diseases of Children" to "Practice of Medicine." The physiology and pathology of infancy and childhood must be studied apart from adult physiology and pathology. Pediatrics has won for itself an independent position, and to those who urge that there is a tendency in all branches of science toward generalization, as evidenced by such terms as comparative pathology, it may be replied that comparison and generalization cannot be undertaken until a mastery of special branches is accomplished. It is desirable, therefore, that text-books on pediatrics should be based upon careful study of the natural history of diseases of children. Text-books of the present day are, as a rule, more free from the fault alluded to than those of a decade ago; and it is because the books under review are commendably free from errors of this sort that we have been tempted to allude to their existence.

The second edition of Starr's *American Text-Book* is somewhat larger than the first, and includes several new articles: "Modified Milk and Percentage Milk Mixtures," "Lithæmia," "Orthopædics." Other

chapters have been rearranged, revised, or rewritten. The number of authors, as in the first edition, is considerable; but the character of the work is nevertheless quite uniform. We are naturally attracted by the new articles. That on modified milk is of very great importance, and is a valuable addition to the work. Those who have followed carefully the increasing accuracy of knowledge regarding the composition and production of milk are, with every reason, convinced of the importance of such knowledge, and insist upon its application to the preparation of food for infants. The accurate and yet simple methods of milk analysis that have been elaborated by chemists have placed the physician in possession of facts regarding the composition of the normal human milk at different periods of lactation that demand greater accuracy in the preparation of artificial substitutes than has been possible in the past. More than this, the same methods have increased very materially our knowledge regarding the effects of altered composition of the milk upon the nutrition and health of children. The careful modification of cow's milk so as to conform as nearly as possible to the normal human milk at a certain period of lactation would seem, then, to be entirely reasonable, and the possibility of carrying out such modification with entire success cannot be questioned. The advantage of this method over the ancient methods of careless dilution and sweetening of cow's milk is undoubted. Dr. Westcott, the author of the article in question, is especially to be commended for the care he has taken to detail a plan for the "home-modification" of milk; for, though the milk laboratories now established in the large cities of this country and in England are available to many, the cost of the milk and the necessarily restricted field of operation of the laboratories limit their usefulness. Home-modification is, therefore, desirable, and the method suggested by Dr. Westcott will aid greatly in increasing knowledge regarding this important advance in scientific pediatrics. The article on lithæmia, by Dr. B. K. Rachford, is of great interest, though we cannot agree with many of the statements of the author, whose studies of kindred conditions in adults are well known. The solution of the pathology of gout and lithæmia has by no means been realized, and, however interesting certain theories may seem, it has not been shown by any means that the retention of the alloxuric bodies in the body-media is the cause or underlying pathologic condition. Those who believe in these theories will readily find cases like that cited by the author (page 95). A child, two days old, was greatly distressed and had a temperature of 104° F. for twenty-four hours. The urine was scanty and blood-tinged. After a warm bath, cathartics, and draughts of water, it began to improve, and urine which deposited uric acid was passed on the third day. Pathologists have long recognized the frequency of uric-acid infarcts in the renal tubules of the new-born, and clinicians have pointed out occasional anuria and distress as symptoms of difficult solution of such infarcts. No one, however, as far as our knowledge goes, has before ventured to regard these as other than quasi-normal conditions. We cannot enter into a consideration of the merits of the classification of various forms of lithæmia in childhood. It is not, of course, improbable that children suffer somewhat as do adults from this vague disorder, but the general opinion that lithæmia is an uncommon malady of childhood is undoubtedly well founded. The new section on orthopedics is eminently adapted to the needs of the general practitioner. In the revision of the article

on vaccinia, reference to the supposed protozoon organisms recently described, and to the advantages of glycerinated lymph, would have been appropriate. The statement that fever may be occasionally present in the second stage of whooping-cough, but is, as a rule, absent, is not, according to our experience, entirely reliable. It is the teaching of text-books, but we have found the exceptions in which continuous fever is observed very numerous. We might select other statements, here and there, for criticism, such as the one that "the most commonly held opinion is that this poison [the cause of rheumatism] is lactic acid;" but the general character of the work is so satisfactory that we forbear to discuss questions of opinion. Some of the articles might be improved by the application of the thought we express in the introductory remarks of this review, though in general the authors write from the stand-point of specialists in diseases of children.

The small work of Dr. Williams is an excellent exposition of the medical diseases of infancy and childhood. Indeed, we are acquainted with no book of its size and scope that has pleased us so much. It is eminently adapted to the needs of the student and young physician seeking to learn the clinical facts regarding diseases of children. The subject of feeding of infants might with advantage have been stated more explicitly. This is a common fault of text-books. After reading over the chapter we fail to carry away any definite impressions of the best methods of procedure in the feeding of infants in general or in special cases. The classification and discussion of the diseases are in every way according to modern ideas; but the treatment of diseases might with advantage have been more thoroughly considered.

Marfan's work is an evidence of the importance the subject of infant feeding has attained. The author considers systematically in separate parts of his book: The Milk; Digestion and Nutrition of Infants, and Feeding. In the first part the chemistry, physiology, and pathology of milk, lactation, and nutrition are carefully discussed; and we note with especial interest the chapters on Substances which are eliminated by the Mammary Gland, and the Microbes of Milk. The question of transmission of infectious diseases is presented in a way that stamps the author as one who accepts advanced modern opinions, though the adverse evidence is not omitted. Cases of transmission of tuberculosis through milk are cited at some length. The discussion of artificial feeding, in the second part, deals extensively with the question of sterilization and Pasteurization, but less thoroughly with modification of cow's milk than we could wish. The author himself recommends a simple and, it seems to us, rather unsatisfactory method. He advises, during the first five or six days of life, milk diluted with an equal quantity of sterile 10 per cent. solution of sugar of milk; during the first four or five months, milk diluted with one-half as much sugar solution; thereafter pure milk moderately sweetened, unless gastro-intestinal disorders arise, in which case he again dilutes the milk with one-third or one-fourth as much sugar-water. A method of this kind would hardly be considered advanced and modern in this country. A. S.

MANUAL OF SKIN DISEASES. With Special Reference to Diagnosis and Treatment. For the Use of Students and General Practitioners. By W. A. HARDAWAY, M.D., Professor of Diseases of the Skin in the Missouri Medical College, St. Louis. Second edition, entirely rewritten and much enlarged. In one handsome 12mo. volume of 560 pages, with 40 engravings and 2 colored plates. Philadelphia and New York: Lea Brothers & Co., 1898.

THE revision of Dr. Hardaway's manual has been so thoroughly and well done as to make a practically new book of it. The alphabetical arrangement employed in the first edition has been abandoned, wisely, we think, for the classification of Hebra as modified by Crocker, this system being regarded as the one best adapted to teaching purposes, out of the many proposed. While fully recognizing the desirability of a rational system of classification, the author makes a plea for a more uniform system of nomenclature, believing this much more urgently needed than new systems of classification; and we are heartily in accord with him in this opinion.

The book is an eminently practical one, but little space being devoted to matters purely theoretical. The clinical features of cutaneous disease are clearly and accurately described, and the directions for treatment are sufficiently full and altogether judicious. A noticeable feature of his edition of the *Manual* is the exceeding thoroughness with which the subject-matter has been brought up to date, all the newest views and discoveries in dermatology finding brief but appropriate mention.

That much discussed disease, seborrhœic eczema, is given a place apart from the other forms of eczema, the author apparently not yet having made up his mind as to the exact place this malady ought to occupy.

We note that the treatment of psoriasis by large doses of iodide of potassium, as advocated by Haslung, is not looked upon with favor; indeed, it is regarded as dangerous. This seems to us an excess of caution hardly justified by experience. There is no doubt that, in a certain proportion of cases, this treatment is very effective; and the number in which it produces serious ill-effects is certainly a very small one.

We notice with some surprise, in a book otherwise so entirely modern, that lupus vulgaris and the scrofulodermata are not described in the section upon tuberculosis of the skin; but the old classification is retained, and they are treated in separate sections, as if they were something other than tuberculous, the author's reason being that they differ clinically from the other more distinctively tuberculous affections of the skin. This reason is, to our mind, altogether insufficient for thus separating lupus vulgaris at least from the other forms of tuberculosis cutis. While it may be desirable to retain the old names, to avoid confusion, it ought to be made clear to the student that, by whatever names these affections are called, and however much they may differ among themselves in some of their clinical aspects, they are etiologically identical—they are all tuberculous and are to be treated as such.

A number of illustrations have been introduced in this edition, but they are of doubtful value in the elucidation of the text, since they are, to say the least, of indifferent quality.

The new edition is, all in all, a very great improvement over the first one, and in its present shape the manual is one of the very best among

the smaller treatises upon diseases of the skin, is thoroughly up to date, and is sure to be found useful by both the student and practising physician. M. B. H.

AN INTRODUCTION TO PATHOLOGY AND MORBID ANATOMY. By T. HENRY GREEN, M.D., F.R.C.P. Revised and enlarged by H. MONTAGUE MURRAY, M.D., F.R.C.P. New (eighth) American edition, thoroughly revised from the eighth English edition, by WALTON MARTIN, PH.B., M.D. Illustrated with 216 engravings, of which 6 are in colors, and a colored plate. Philadelphia and New York: Lea Brothers & Co., 1898.

GREEN'S pathology has passed through almost as many editions as the masterwork of Ziegler, a proof of its great popularity. We had occasion to review the book in its seventh edition for another journal several years ago, and found then considerable to criticise. The American editor of the present edition has, however, greatly improved the work and has brought it fairly well up to date. The classification has been considerably changed and for the better. The first part, General Pathology, is divided into disturbances of the circulation, regressive and progressive changes, vegetable parasites, animal parasites, this being a chapter newly added; infective granulomata, septicæmia and pyæmia. Inflammation is treated in an interesting way, and due attention to recent advances is given. The classification of tumors is based on their origin from the layers of the blastoderm, with the result that carcinomas and adenomas are stated to be derived exclusively from the epiblast and hypoblast, notwithstanding the fact that a number of these tumors, as in the uterus and ovaries, grow from epithelium of mesoblastic origin. The divisions of cancer are somewhat antiquated, but the features of the various tumors are clearly described. In the subject of bacteriology, we notice, with some surprise, the statement that no case of erysipelas from inoculation of a wound with pus containing streptococci seems to have been recorded. Several of such cases, if our memory serves us rightly, have found their way into the literature. The special pathology of organs is discussed briefly and concisely; some sections have, perhaps, received too scant consideration, as, for example, the stomach, which is disposed of in less than two pages.

There is a peculiar charm about the style of the book. Its diction is superior to that found in the ordinary text-book. The typographer's work is also excellent. The original illustrations are nearly all very good, and the editor has very wisely added a large number of excellent cuts from the best German text-books. In its transformed state we can recommend Green's *Pathology* as a valuable and useful book for students. D. R.

A TEXT-BOOK OF PATHOLOGY. By ALFRED STENGEL, M.D. With 372 illustrations. Philadelphia: W. B. Saunders, 1898.

A GOOD text-book on pathology in the English language has long been the *pium desideratum* of teachers and students. While there are many works on pathology in our language, there are few that are thoroughly imbued with the modern trend in pathologic science. No branch

of medicine is more active or more progressive than pathology, and earnest study and patient effort are required to keep abreast with the vast literature which emanates from the laboratories of all lands. The author of the book before us has produced a work not only of marked individuality, but one which very nearly realizes the hopes of those who have longed to see a good English text-book on this subject. That the author should be an American is a cause of just pride. The division of the book is that adopted by Ziegler and the best German writers, namely, into general and special pathology. After a brief chapter on etiology and the disorders of nutrition, the disturbances of the circulation of the blood, and retrogressive and progressive tissue changes are taken up. Recognizing the difficulties attending all attempts at classifying tumors, the author has entirely avoided their classification. A classification of tumors is, however, very desirable, and we regret that the author did not attempt it. The various tumors are clearly described, both macroscopically and microscopically. The angiosarcomata have not received perhaps as exhaustive a consideration as their importance demands. A most satisfactory chapter is that on bacteriology, which contains in concise form the important details regarding bacteria and the diseases they produce, and gives evidence of a thorough knowledge on the writer's part of the latest investigations. The meningococcus of Jaeger-Weichselbaum seems to have escaped notice, but is mentioned later, though somewhat briefly, in the section on meningitis.

The part devoted to special pathology deals successively with diseases of the blood, of the lymphatic tissues, of the circulatory system, of the respiratory system, of the gastro-intestinal tract, of the ductless glands, of the urinary organs, of the bones, the joints, and the muscles, and of the nervous system. Diseases of the eye, the ear, and the skin have been omitted, the author holding, as he states in the preface, that they more properly belong to special works. All of the chapters of the special part give proof of the author's practical acquaintance with pathology in the post-mortem room and in the histologic laboratory, as well as of his intimate knowledge of the literature. By closely adhering to a uniform plan of treating the diseases of each organ and by the adoption of display-type, the author has materially lightened the labors of the student. The chapters on the Diseases of the Nervous System merit special praise; they are thorough and show an admirable mastery over that most difficult and intricate subject in pathology.

The book is profusely illustrated by good original and well-chosen borrowed cuts. The introduction of numerous photographs of living patients to illustrate macroscopic lesions is commendable.

We do not hesitate in predicting that the work will be one of the most popular books published in recent years. D. R.

ARTIFICIAL ANÆSTHETICS. By LAURENCE TURNBULL, M.D., Ph.G., Aural Surgeon to the Jefferson Medical College Hospital, Philadelphia, etc. Fourth edition. Revised and enlarged. Pp. xxiv. 550. Philadelphia: P. Blakiston, Son & Co.

THIS manual of anæsthetic agents and their employment in the treatment of disease has deservedly reached its fourth edition, for it contains

what is necessary to be acquired by every student of medicine who wishes to have a thorough and exact knowledge of anæsthesia. That this knowledge is not insisted upon by the schools for undergraduate medical students is shown by the every-day history of medical and surgical practice. A single hour in the operating-room of a large hospital would demonstrate the absolute ignorance and gross carelessness of the average junior assistant. If argument were wanting as to the comparative safety of ether or chloroform, the fact that death under anæsthesia is very infrequent in this country would furnish it. It is the duty of the schools to see that no one is graduated unless he has passed a theoretical and practical examination upon this subject. Until this is done the pernicious example of the present will continue to have its influence upon the future house staff. The marked safety of ether has been sufficiently demonstrated so that the anæsthetizer need not feel that it is incumbent upon him to prove that it is extremely difficult to kill a patient while under its influence. This book is not for the undergraduate to read; it is his duty to study it. We wish that this edition had been rewritten instead of being revised, for, as it now stands, it seems uneven. If we were disposed to be critical we might wish that it had been more thoroughly revised and such errors as these eliminated: NG—N_2O (p. 41), and No — N_2O (p. 69) for NO — N_2O; $C_2H.Br$ for C_2H_5Br (p. 227); CINH for C_4I_4NH (p. 468); CH for $C_{10}H_8$ (p. 485), which, by the way, appears as naphthaline instead of naphtalin; and $C_{20}H_5OH$ for C_2H_5OH (p. 489). The paragraph on page 201, devoted to methylic ether, is remarkable for the amount of misinformation which it contains: neither the chemical formula, synonym, nor method of preparation is correct. Vernuil (page 230 and index) and Bandeun (page 442) are new names for old acquaintances, and *soporo*, "meaning natural sleep" (from the Latin), is certainly not of the time of Cicero. And although the author is quoting a circular lauding a nostrum, yet he should have shown that the derivation of the name was misleading equally with the rest of the announcement. While we may not altogether agree with Laborde, we think that the review of his method of lingual traction is unnecessarily severe (page 282) We commend the Student's Summary (page 488 *et seq.*) and the Legal Responsibility of Physicians (page 516 *et seq.*) for their conciseness and practical application. We are pleased to welcome the old friend of our student days and to commend it to the thoughtful student of the present time. R. W. W.

ATLAS AND ESSENTIALS OF BACTERIOLOGY. By PROF. K. B. LEHMANN, Chief of the Hygienic Institute in Würzburg, and DR. RUDOLF NEUMANN, Assistant in the Hygienic Institute in Würzburg. With 63 chromo-lithographic plates, comprising 558 figures, and numerous engravings. 8vo. pp. viii. 204. New York: William Wood & Co., 1897.

EVERY worker in the vast field of bacteriology is at times confronted by doubt as to the nature of some germ which he may have encountered for the first time. He believes it to be identical in its characters as determined by him with some species of which he may have a description; but a measure of doubt remains, for the complete removal of which

he must have access to a standard culture of the germ in question. Only by careful comparison of the growths obtained by him on the various culture media with those of the standard germ can he in all cases finally determine the identity of his own.

Few, however, are so fortunate as to have access to a collection of bacteria of sufficient size and reliability to meet all requirements of this sort, and to those who have not, the *Atlas of Bacteriology* before us affords the next best resort. Indeed, in many instances the plates contained in it give almost as helpful information of the various biological characters of the germs they represent as do the cultures themselves. This is due in part to the large number of illustrations given of each germ—its growth on gelatin and on agar, both in surface and stab-cultures, on potato and in plates, as well as its minute morphology being given in most cases—but even more to the excellent reproduction of color and relief effects. No artificial representation can be expected to reproduce fully the picture of living cultures, but in the present plates we find an approach thereto almost beyond expectation. This is undoubtedly due to the fact that in the preparation and printing of the plates the greatest care has been exercised in the selection of the colors, no effort having been spared to make the final result approximate the original as nearly as possible. To obtain this we are told that in some instances as many as twenty-one separate and distinct color impressions have been required to produce a single plate.

The volume also comprises a very considerable collection, more or less complete illustration being afforded of about eighty different species, including all those of pathological importance.

Finally, the descriptions of the plates are ample, and are conveniently arranged on pages fronting the plates to which they respectively refer.

While the great usefulness of the volume is in its plates, we must mention also a brief but excellent statement of the general biological characters of the bacteria as a group. This occupies about 100 pages, and is followed by a "Technical Appendix," in which the various methods of studying the bacteria are detailed. An index completes the volume. J. S. E.

ATLAS OF EXTERNAL DISEASES OF THE EYE. By A. MAITLAND RAMSAY, M.D. With thirty full-page colored plates and eighteen full-page photogravures. Glasgow: James MacLehose & Sons; New York: The Macmillan Company, 1898.

SINCE the publication of the works of Demours, von Ammon, Dalrymple, and Sichel—that is, from 1818 to 1859—there has been little attempt to portray in colors the external diseases of the eye, if we except Salzmann's edition of Jaeger's *Hand-Atlas* and the treatises of Henry E. Juler and George A. Berry, all of which contain a certain number of colored plates descriptive of external ocular disorders. Therefore, it is with much interest that one turns to Haab's *Atlas der Äusseren Erkrankungen des Auges* and Ramsay's *External Diseases of the Eye*, which appear almost simultaneously, as notable contributions to ophthalmic literature.

Although, as announced, Dr. Ramsay's *Atlas* contains thirty full-

page colored plates and eighteen full-page photogravures, this statement does not give an adequate idea of the wealth of illustration, because most of the colored plates contain several chromo-lithographs, in all one hundred and thirty, which, added to the eighteen photographs, make a total of one hundred and forty-eight illustrations.

The photographs are excellent, and with perhaps a single exception (chronic glaucoma) give well-nigh perfect pictures of the diseases they are intended to represent. Particularly admirable are those illustrating ptosis, œdema palpebrarum, and exophthalmic goitre.

It would be absurd to expect among one hundred and thirty chromo-lithographs equal excellence, but it is not too much to say that there are few poor ones in the collection, and from the majority a diagnosis of the ocular condition could be made almost as readily as if the disease itself were present in the living eye. The reviewer extends his hearty congratulations to author and publisher upon the excellence of the reproductions.

There is a fairly full discussion of all of the diseases that are portrayed. Indeed, to quote the preface, Dr. Ramsay has "endeavored to make the letter-press not only descriptive of, but also complementary to, the plates, so as to give as faithful a clinical picture as possible of all of the diseases dealt with," and he has succeeded admirably. We regret, however, that a paragraph on the most essential treatment of each disease is not added. To be sure, treatment is incidentally mentioned here and there, but nowhere systematically recorded. Now, while it may be argued that an atlas is not a book on therapeutics, such an atlas is primarily intended—as, indeed, the preface distinctly states—for those whose opportunities are not sufficiently great to bring them in contact with much clinical material; and while we do not for a moment doubt that it will be of great aid to such practitioners in diagnosis and clinical study, it would be of still greater aid if the therapeutic measures suited to the diseases described were recorded; and we know no one who could have supplied this want more accurately than Dr. Ramsay. In this respect Haab's *Atlas* will be a serious rival, as in addition to very excellent illustrations and descriptive text it contains sections devoted to prognosis and therapeutics.

Ramsay's *Atlas* will be useful not only to the practitioner who is not constantly brought in contact with cases of ocular disease, but to the student and to him who teaches the student. Indeed, the book is the outcome of illustrations which Dr. Ramsay used in his lectures on diseases of the eye at Queen Margaret College. We congratulate the students who listened to those admirably illustrated lectures. The reviewer can testify from personal experience that the book is an aid in demonstrating to classes, and recommends it to practitioner, student, and teacher.

G. E. DE S.

APHASIA AND OTHER SPEECH DEFECTS. By H. CHARLTON BASTIAN, M.A., M.D., Lond., F.R.S. New York: D. Appleton & Co., 1898.

PERHAPS no one is better fitted to deal with speech defects than is the author of this book, and certainly no one has given us a more comprehensive view of the subject. Many of the chapters have appeared

before in the columns of *The Lancet*, but much new material has been added.

All defects of speech are classified under two general heads, namely, those due to subcortical and those due to cortical lesions. Still two other divisions are made of the first class, and in the one are put those defects due to lesions in the bulbar and spinal motor-centres, and in the other those due to lesions in the pyramidal system of fibres.

The defects coming under the head of the first one of these subdivisions are called anarthria or dysarthria, and those under the second are called aphemia, while aphasia is the term applied to those due to cortical lesions. This is a very satisfactory classification, and it opens the way to a simpler nomenclature than has been employed hitherto in treating of this complex subject.

The author holds that there is no special "centre for concepts," and also argues against the existence of distinct topographical speech-centres. He also makes out a fairly clear case in favor of the motor-centres of speech being in the bulb and spinal cord rather than in the cortex. The so-called "motor-centre of Broca" the author names the "glosso-kinæsthetic centre," and he believes it to be not a motor, but a sensory centre, the function of which is to "guide" movements for speech. This is a point not easily proved, but there seems to be no good reason for supposing the existence of a cortical motor-centre for speech when all the phenomena may be explained without such supposition.

The author claims to be the first to discover and name the "kinæsthetic" centres. It is in these that the memories or impressions of the movements for spoken and written language are stored up. These centres, the "glosso-kinæsthetic" for spoken and "cheiro-kinæsthetic" for written language, are employed in the expression of thought rather than in the thought-process itself. The book deals with the acquired defects of speech only, and contains thirty-one illustrations. The histories of one hundred and fourteen cases are also given, illustrating the different kinds of defects, and in many of the cases necropsies were performed, which alone can give much weight to the conclusions. It is probably the most up-to-date work we have on this important subject. G. H. M.

THE POCKET THERAPIST. By THOMAS STRETCH DOWSE, M.D., Fellow of the Royal College of Physicians of Edinburgh, etc. Pp. 192. Bristol: John Wright & Co., 1897.

THE sub-title reads: "A concise manual of modern treatment for students and junior practitioners, arranged alphabetically for ready reference." The first one hundred and seventy-five pages take up the treatment of all sorts of morbid conditions from abortion to worms. We hope that the newly-fledged practitioner knows as much about the treatment of certain diseases as this book tells him; he certainly should if his school has done its duty. On the other hand, this may be a reminder of matters forgotten. If the work has any value, it is a record of those measures which the author has found to be valuable;

he has left unnoticed those found to be useless. The suggestions show an acquaintance with recent literature, if erythrol tetra-nitrate and eucaine are evidence. Sometimes they seem trivial, as a two-grain quinine pill, thrice daily, for bromidrosis; or are misleading, as "for attacks of dyspnœa and angina, trinitrin should be tried, or nitroglycerin." The author seems to think it his duty to warn the above-mentioned junior as to new remedies; of some he will imagine their origin, as chinosol, valsol—be it ichthyol, menthol, salicylic, chloroform—camphor, iodine, or iodoform, or iron jelloids, while others may not be very familiar, as Fletcher's vibrona, emol-keleet, or jugum penis for enuresis nocturna. One remedy is frequently recommended, and it is to be obtained in Cannon Street, E. C. It is branalcane, and is supposed to benefit bromidrosis, cancrum oris, croup, diphtheria, gangrene of the lung, fissure and pruritus of the anus, stomatitis, both plain and aphthous, hay-asthma, leucorrhœa, and sore-throat. We wish that we could indorse the author's commendation, but we cannot, for the text-books and even the advertising pages of the journals are silent as to its composition. In the mean time it seems that it might be useful to the orificial surgeons, and their attention is respectfully directed to it. The remainder of the book is devoted to health-resorts, poisons and their antidotes, metrical measures, the urine, sputum, method of staining tubercle bacilli, vomit, feces, and therapeutic serums.

Books of this order should have a very limited use; we fear that they are incentives to indolence. We regret that the author has written this; he is worthy of far better things.

R. W. W.

Retinoscopy (or Shadow Test) in the Determination of Refraction at One Metre Distance with the Plane Mirror. By James Thorington, M.D., Adjunct Professor of Diseases of the Eye in the Philadelphia Polyclinic and College for Graduates in Medicine, etc. Second edition, revised and enlarged. Thirty-eight illustrations, twelve of which are colored. Philadelphia: P. Blakiston, Son & Co., 1898.

The study of retinoscopy by the plane mirror by students interested in acquiring proficiency in this essential objective method of estimating refraction errors received a decided impetus from the publication of the first edition of Thorington's work, and we do not hesitate to say that the beginner in ophthalmology has found great aid and benefit from its perusal. It presents the subject plainly, clearly, accurately, tersely; and careful reading, together with the application of its principles to clinical cases, will do much to familiarize the student with the essentials. In no other book are the principles of retinoscopy so well taught, and with such practical bearing, as in this work of Thorington, and it is with the greatest pleasure that we heartily recommend the second edition to every refractionist. The book is well bound, well printed on good, thick paper, and thoroughly well illustrated.

H. F. H.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

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AND

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Concerning the Coagulation Action of Gelatin on the Blood.—L. CAMAS and E. GLEY (*Société de Biologie*, November 18, 1898) state that Dastre and Floresco showed that the coagulation of dogs' and rabbits' blood is considerably increased by the injection of a 5 per cent. solution of gelatin into their veins. They then ask the question: Is the same result to be expected to follow subcutaneous or intraperitoneal injections? *A priori*, they hold that there is every reason to doubt that it does.

Lancereaux and Paulesco conducted a series of experiments on rabbits in connection with the former's method of treating aneurisms by gelatin injections. They found that the rapidity of coagulation of the blood was increased by 100 c.c. of a 2 per cent. gelatin solution into the animal's peritoneal cavity.

Camus and Gley made intraperitoneal injections of gelatin in rabbits in three cases, and in every instance the coagulation time of the blood was delayed. They believe that the absence of an increased rapidity of coagulation is due to the gelatin being non-dializable. They believe that when gelatin, injected subcutaneously, disappears after several hours it does not enter the vessels as such, but first undergoes a modification of the nature of a digestive process.

The Effect of the Injection of Salt-Solution and Gelatin.—At the session of the Paris Academy of Medicine held November 29, 1898, the subject of the capability of the organism to absorb gelatin and its effect on the coagulability of the blood was again under discussion.

Lancereaux, contrary to the opinion of M. Laborde, held that gelatin is soluble in artificial serum and is not precipitated at the temperature of the body. Moreover, many non-dializable substances, such as sero-fibrinous

effusions, œdematous and ascitic fluids, are capable of being absorbed by the organism.

His experiments had unquestionably shown that gelatin injections augmented the coagulability of the blood, and that the quantity of gelatin in the peritoneal cavity several hours after the injection was considerably less than the amount originally introduced. From this it must be concluded that some of the gelatin was absorbed. He held that the opinion advanced by Laborde, that peptonization of the gelatin was necessary before absorption could take place, was purely hypothetical.

Laborde, in reply, stated that the results of recent experiments had confirmed his earlier ones in that he found that practically no gelatin was absorbed after its injection into the peritoneal cavity. He held, however, that at the end of a certain time it may disappear, owing to its undergoing peptonization and absorption. He believed that any action the gelatin possessed was due to its conversion into peptone. Laborde stated that the determination of the coagulability of the blood presented the greatest difficulties, because it varied markedly from one moment to another without any regularity, and was so readily influenced by faulty technique. He believed, then, that no precise conclusions could be drawn from Lancereaux's experiments on the coagulability of the blood.

Hayem took part in the discussion, and stated that, although he had had a great deal of experience in the determination of the coagulability of the blood, his results had been so variable and contradictory that he was forced to lay them aside. He did not agree with the view of Laborde that for a substance to be absorbed it must be dializable. In support of his view he cited the observation that if dogs' blood be injected into the peritoneal cavity of the goat the red cells of the former, which are larger than those of the latter, are found in the circulating blood of the goat after four or five hours.

Laborde objected to Hayem's argument, because in this case one has to deal with a living body, the red blood-corpuscles; whereas gelatin is an unorganized and non-dializable substance.

[During the past three months the injections have been used in five cases of aneurism in my wards. In one the first injection caused so much pain that the patient refused further treatment. One patient died (after about five injections) of hemorrhage. Of the remaining three cases in which the injections have been given systematically one is decidedly better; two present no changes.—W. O.]

The Effect of Turpentine Inhalations in Experimental Tuberculosis.—J. HÉRICOURT and CHARLES RICHET (*Société de Biologie*, November 18, 1898) at the session of the Société de Biologie on November 12, 1898, gave the results of their experience with the use of turpentine inhalations in the treatment of experimental tuberculosis in dogs. The administration of the drug by inhalation is preferable to that by subcutaneous and intravenous injection or to administration by the mouth, for various reasons. It does not require an operation, the drug is brought into direct contact with the bacilli in the lungs, and the dose can be carefully graduated until nearly a poisonous dose is reached.

Their procedure was to place the dogs in a box through which air charged

with turpentine vapor was passed. They were kept in the box for one hour, and during this time 1200 litres of air charged with 12 grammes of turpentine were passed through it. The inhalations were given every fourth day from March 14th to August 2d.

In order to compare this method of treatment with some others they inoculated eleven dogs on March 2d with a tenth of a cubic centimetre of a three-months' culture of human tuberculosis. Three dogs were not treated, and they died on the twentieth, twenty-seventh, and forty-ninth days after inoculation, respectively. Three others were treated by intratracheal injections of iodine (0.015 gramme to the litre), and two died on the twenty-fourth and sixty-sixth days. With two of the dogs intravenous injections of turpentine were used, and they died on the forty-fifth and eighty-fourth days. The turpentine inhalations were used in the remaining three dogs, and only one died, death occurring on the twenty-fourth day. The other two dogs were alive and healthy at the time their report was made, two hundred and fifty-one days after inoculation. The turpentine inhalations had thus given by far the best results. They claim that the success of this treatment is emphasized by the fact that in not a single instance out of two hundred dogs inoculated during a period of ten years and allowed to go untreated had the animal lived longer than six months.

The series of animals in which they had tested this treatment is unfortunately too small to draw definite conclusions from. The practical importance of their work rests in the possibility that similar turpentine inhalations may also be of value in the treatment of human tuberculosis.

The Inoculation Theory of Malarial Infection.—BIGNAMI (*The Lancet*, December 3 and 10, 1898), in a most interesting article on the mode of conveyance of malarial infections, refers to a previous communication in the same journal for 1896, in which he held that it was very improbable that malarial infections were conveyed either by water or air. In the same article he expressed the opinion that "malaria behaves itself with regard to man as if the malarial germs were inoculated by mosquitoes." Great stress was attached to one argument in favor of the inoculation theory, viz., its analogy to the Texas cattle fever, in which Smith and Kilborne had demonstrated that the infection was conveyed by means of the tick. Bignami then refers to Manson's discovery of malarial flagellæ in the bodies of mosquitoes and to his view that these bodies represented the extracorporeal life-cycle of the malarial parasite. He cites the important discovery of Ross that the gray mosquito is capable of transmitting the halteridium-Labbê from sparrows whose blood contained this organism to uninfected birds.

In 1894 Bignami and Dionisi conducted some unsuccessful experiments with the view of determining whether the mosquito was capable of conveying the disease. Bignami does not think that the negative results discredit the hypothesis, as he believes that the proper species of mosquito was not used.

Laveran, in the last edition of his work on malaria, merely alludes to the inoculation theory. Koch, while not bringing forward any proof in support of the view, recently expressed the opinion that the malarial parasite has the same relation to the mosquito that the parasites of Texas fever have to the cattle-tick.

Bignami, in approaching the subject anew, sought to obtain indirect proof of the mosquito inoculation theory by protecting a certain number of individuals from mosquito bites by the use of netting, etc., and to expose a corresponding number to the ravages of the mosquito. If the protected persons remained free from malaria and a certain number of the unprotected developed the disease, this would afford indirect proof on the side of the inoculation theory. This experiment, however, had to be given up, owing to the difficulties encountered in carrying it out.

He then determined to resort to the direct method of investigation by endeavoring to show that patients bitten by mosquitoes obtained from a highly malarious district acquire the disease. In order to fortify any positive results he might obtain it was necessary that certain conditions should be secured. The experiment should be carried out in an environment known to be non-malarious; the individual experimented upon must not have had malaria, and must have lived in a hospital under medical supervision for as long a time as possible; and the experiment should be conducted for several weeks, during which time frequent renewals of mosquitoes must be made.

These conditions were all present in the case in which the experiments were successful; in fact, the patient, a nervous case, had never been outside of the wards of the Santo Spirito Hospital in Rome for six years, during which time he had been under Bastianelli's care. Grassi had shown that malarious districts are infested with a certain species of mosquitoes never found elsewhere. During the experiment, which began on September 26th, a competent person collected three species of adult mosquitoes daily from pools in highly malarious regions of the Roman Campagna. Thus there was a supply of adult mosquitoes placed in the "mosquito-room" in which the patient slept each night. He was severely and frequently bitten. On October 1st his temperature became elevated, and he had marked chilly feelings. These persisted during October 2d, and he was given quinine subcutaneously in the afternoon. On October 3d, about forty hours after the onset of the fever, a blood examination revealed young amœboid hyaline intracellular malarial parasites. Later in the day parasites were found containing pigment and presenting the characteristic features of æstivo-autumnal parasites.

Bignami thinks that this experiment affords, for the first time, practically absolute proof that malarial infections are conveyed by the bites of mosquitoes.

As to the species of mosquito that conveyed the infection, Bignami thinks that either the Culex penicillaris or the Culex malariæ (Grassi) were the most likely ones. These, with the Anopheles claviger, are believed by Grassi to be found only in malarious districts.

Finally, Bignami states that malaria is a disease which is contracted by inoculation—a fact of which we have now the first experimental proof. He claims, further, that everything points to the conclusion that inoculation is the only way by which infection is acquired, since air and water as carriers of infection may be excluded, and because arguments based on analogy all tend in the same direction. This much at any rate we can assert, namely, that inoculation is the only mechanism of infection which has been demonstrated experimentally.

On the Structure of the Semilunar and Flagellate Bodies of Malarial Fever.—BIGNAMI and BASTIANELLI (*The Lancet*, December 19, 1898), in reporting the results of their study of the structure of flagellated malarial parasites, refer to Manson's view that they represent parasites in sporulation, the spores of which, "in the interests of the extra-corporeal life of the plasmodium," take on this special form of mobile and flagellated filaments. Grassi and Feletti had previously advanced the opinion that they represented nothing but the dying forms of the parasite, and pointed out that no one had hitherto demonstrated in these filaments the structure which ought to be found in spores, namely, chromatin. Sacharoff, subsequently, in studying the internal structure of the flagellates of crows, considered the flagella as chromosomes originating in the nuclei of the body of the parasite, and flagellation as a process of perverted karyokinetic division accomplished in a violent manner.

During the summer of 1898 Bignami and Bastianelli investigated the structure of the crescents and their derivative flagellate bodies, and the flagellates derived from the tertian organism. For this purpose they used the Romanowski method of staining. As a result of their study they found that in the majority of flagellates the flagella consist essentially of a filament of chromatin well brought out by the Romanowski method. The flagellates derived from the crescents and pigmented tertian bodies do not all present the same details of structure. A moderate number present the appearance of a protoplasmic body containing in its mass some filaments or blocks of pigment. From the protoplasmic bodies of these forms there usually project four flagella, apparently entirely made up of protoplasm and containing no chromatin. Then there are other flagellate bodies—and these are more numerous—which possess a pigmented protoplasmic body in which the particles of chromatin have emigrated to the periphery. From these peripheral chromosomes issue filaments of chromatin which form the principal part of the flagella. This form generally has four flagella as well. Finally, there are a few flagellates, some flagella of which contain chromatin, while others consist of protoplasm alone. In the rare instances in which they were able to find an isolated stained flagellum it always appeared as though the chromatin occupied the centre and was covered by a peripheral layer of protoplasm. The chromatin in these flagella was quite definitely shown to be derived from the nuclei of the parasites. Bignami and Bastianelli do not mention the importance of the presence of chromatin in the flagella and its bearing on the fertilization process observed by MacCullum to take place in human and avian malarial parasites. They hold that the crescents are sterile bodies in man and as far as man is concerned. Further, they had previously forwarded the hypothesis that the crescents represent those phases of the life of the malarial parasite which in other parasites are continued and completed outside the host. This hypothesis had received confirmation, from the observation of Ross, Grassi, and themselves, that the crescents do actually develop in the middle intestine of the mosquito (Anopheles claviger).

Hypertrophic Cirrhosis of the Liver, with Enlarged Spleen and Icterus, in Three Children of the Same Parents.—HASENCLEVER (*Berliner klin.*

Woch., 1898, No. 45) reports an interesting observation. The father had no history of syphilis, but had apoplexy when thirty-two years old. The liver disease appeared in the children at the ages of eighteen, twenty, and sixteen years. All had chronic enlargement of the liver, constant and intense jaundice, early appearance of enlarged spleen, and no evidences of portal congestion. The disease came on with remissions and exacerbations. The three patients showed very defective growth as compared with a healthy brother and sister of nearly the same ages, and a sister of four years. There had also been one abortion and three early deaths in the family. The patient first attacked died after a profuse gastric and intestinal hemorrhage. There was no ascites. The enlarged liver showed no scars, but was hob-nailed. There were no peritoneal adhesions. Microscopical examinations showed thickening of the capsule and an interacinous growth of connective tissue of somewhat irregular distribution, with hypertrophy and atrophy of the liver-cells, and but little new growth of the biliary ducts. The bile capillaries contained fine granular concretions and the liver cells much yellow and brown pigment. The author discusses the various etiological possibilities, leaning, with evident justice, to the theory of inherited syphilis. He suggests that the faulty development of the patients was due to inherited syphilitic disease of the liver, which latter ultimately showed itself as hypertrophic cirrhosis.

Hysterical Paroxysmal Œdema.—EDGEWORTH (*Bristol Medico-chirurgical Journal*, September, 1898, p. 206) reports three cases of paroxysmal localized œdema.

The first case was a man, aged twenty-four years, who gave the history that he would go to bed quite well, and awake in the morning to find that some part of the body, the foot or leg, arm or hand, often the face, and rarely the trunk, had become markedly swollen. This would last all day, and gradually subside. There was a burning, itching pain in the slightly red, swollen part, which could not be indented by the finger. There was no anæsthesia, analgesia, or thermo-anæsthesia of the skin in either the affected or the normal parts. The patient was observed in several repeated attacks. In one attack the lips and the left side of the face were involved. There was no family history of any similar affection. The case was treated by arsenic in increasing doses, and the attacks became less acute and occurred only at greater intervals.

In reviewing the distribution of the areas of œdema in this case, Edgeworth decides that they were very similar to the alterations in sensibility in some cases of hysteria. The case was considered one of vasomotor neurosis, of cerebral and probably cortical origin.

A second case, a man, aged twenty-two years, had during twelve months been troubled with localized swellings of the hands, or hands and forearms, or feet. These would last twenty-four hours and then subside. In one of the attacks in which one of the hands and forearms were involved, the affected area corresponded accurately with that covered by a high-buttoned glove. In this attack the skin affected by the œdema, and for some distance above it, was partially anæsthetic to touch and to heat and cold, and totally analgesic to the prick of a pin.

In this case the fact that the area of the disturbance of sensation was not

limited to the area of œdema alone suggested strongly that the condition was of an hysterical nature.

The third case was that of a woman, aged thirty-seven years, who would be awakened between 2 and 3 A.M. by a numb pain in the left arm, and find that the arm from the shoulder downward was slightly hot, not red, but felt heavy. She would fall asleep again, and by morning the swelling would almost entirely have disappeared. In this case there were almost complete analgesia and thermo-anæsthesia, while tactile sensibility was normal.

Sydenham first described an hysterical œdema. It is rarely an isolated phenomenon, generally coexisting with arthralgia, paralysis, or contracture. While its duration is variable, it is usually a most persistent phenomenon, and may last for years.

The cases reported by Edgeworth differ from these, more especially in their paroxysmal type, though otherwise they are similar. During recent years a disease has been differentiated, to which various names have been given: angio-neurotic œdema, paroxysmal œdema, vasomotor œdema, and Quincke's œdema. The disease has been well described by Osler. It is characterized by local œdematous swellings, more or less limited in extent, and of transient duration. Severe colic is frequently associated with each attack. There is often a marked hereditary disposition; in one instance the disease was traced through five generations in one family. Its pathology is quite unknown, though Quincke and most observers consider it to be a vasomotor neurosis.

Edgeworth claims that his cases do not exactly conform to the descriptions of angio-neurotic or Quincke's œdema. He thinks that hysteria was an important etiological factor in the cases he reports. In the matter of treatment, arsenic in large doses is worthy of trial, and in one of Edgeworth's cases appeared to cure an affection which had lasted eleven years.

Phlegmasia Alba Dolens in Pneumonia.—J. M. DA COSTA (*Philadelphia Medical Journal*, September 10, 1898) has called attention to this rare complication of pneumonia. He has had three cases under observation, and has collected six from the literature. Of the nine, five were on the left side, two on the right, and two, Dr. Da Costa's recent cases, were bilateral. The prognosis is favorable, though the recovery may be tedious. John T. Metcalfe many years ago reported a fatal case. The usual seat of the lesion is in the internal saphenous or in the femoral vein, or in both.

Glycosuria and Gallstone-Colic.—ZINN (*Cent. f. innere Medicin*, September 24, 1898) refers to the fact that glycosuria has frequently been found by some clinicians in cases of cholelithiasis, whereas other observers have never found it. Exner examined the urines of forty cases of cholelithiasis in the surgical clinic at Heidelberg and found sugar present in every case but one. From this experience he considered the presence of sugar in the urine in doubtful cases of cholelithiasis of some diagnostic importance. All the cases were operated on, and the sugar always disappeared three to four weeks afterward. Zinn's results, from the examination of the urine in eighty-nine cases of cholelithiasis in Gerhardt's clinic in Berlin, showed glycosuria in only two instances. In both the presence of the sugar was only transitory.

Although Ord, Kraus, and Loeb have seen glycosuria follow gallstone-colic, Naunyn failed to find a single instance in 250 cases. He did observe glycosuria, however, in a few cases of gallstone associated with cirrhosis of the liver. From these statistics it would seem that glycosuria is very uncommonly associated with gallstones.

PÆDIATRICS.

UNDER THE CHARGE OF

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AND

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Value of the Sign of Kernig in the Diagnosis of Meningitis.—NETTER (*Société Médicale des Hôpitaux*, July 22, 1898) calls attention to this phenomenon, which was first remarked in 1882 by Kernig, of St. Petersburg, and was subsequently confirmed by Henoch, Bull, Blümm, and Friis. It is elicited in the following way: The patient is placed in dorsal decubitus, care being taken that the legs are relaxed and fully extended at the knee. When the child is raised to the sitting posture it is found that the knees are more or less flexed, and, despite all efforts, cannot be completely extended on account of contracture of the posterior muscles of the thighs. In some cases the angle made by the thigh and the leg is a right angle, and in no case has it been found to be greater than 135° or 140°. Complete extension becomes possible when the patient is put upon the back again. According to Netter's observation in forty-six cases of meningitis of whatever nature, this sign was wanting in but five cases, or about 10 per cent. It has not been observed in other conditions, having been found absent in numerous cases of typhoid fever, pneumonia, acute articular rheumatism, chorea, central affections in infants, erythema nodosum, and similar diseases. Netter believes that the presence of this sign confirms the diagnosis of meningitis when the symptoms are obscure, and suggests a latent meningitis when it is the only symptom present.

Two cases are quoted. One was a clear case of typhoid fever, but Kernig's sign was present. The patient died of a perforation, and the autopsy revealed the presence of a meningitis due to the staphylococcus aureus, together with the intestinal lesions of typhoid fever.

A second patient presented Kernig's sign, with slight symptoms of meningitis. Lumbar puncture was made, but withdrew no fluid. After a remission of ten days fever reappeared, and a fluctuating mass was discovered over the sacrum. This was incised, and the pus was found to contain the meningococcus. The infection had spread from the spinal canal, following the track made by the needle. The presence of meningitis was thereby established.

All varieties of meningitis are said to produce this sign, including tuberculous meningitis, secondary forms, and cerebro-spinal meningitis.

The Symptom of Bolognini in Measles.—A. KŒPPEN (*Centralblatt f. innere Medicin*, 1898, No. 26, S. 673) refers to a symptom described some years ago by Bolognini as existing in measles. This consisted in a peculiar sensation of friction, felt when gently rubbing the tips of the fingers over the surface of the abdomen with gradually increasing force. This phenomenon, which, according to Bolognini, could be felt from the prodromal period well on to the end of the disease, was considered to be due to a morbillous eruption upon the peritoneum, and he considered that it offered a diagnostic sign of measles.

Recently Kœppen had opportunity to control these observations in the course of an epidemic of the disease, during which he specially examined 316 children, several of them on more than one occasion. The symptom of Bolognini was observed in only 154 of these patients. Moreover, the author has been able to convince himself that the phenomenon consists not in a sensation of friction (frottement), but rather in a fine crepitation which recalls that given by subcutaneous emphysema, and seems to be due to the presence of bubbles of gas in the intestines. Indeed, most of the children in whom Kœppen found this symptom were suffering from diarrhœa with foamy stools.

Finally, the author has observed the existence of this symptom, though to a less marked degree than in measles, with children suffering from digestive troubles and who were free from measles. With healthy subjects he has never observed the phenomenon.

It follows from these later observations that the symptom observed by Bolognini, while very frequent in measles, cannot be considered as a pathognomonic sign of this affection.

A Peculiar Form of Post-Morbillous Pneumonia in Children.—IVAN HONL (*Revue Mensuelle des Maladies de l'Enfance*, August, 1898, p. 386) presents an interesting pathological study of a form of pulmonary inflammation which he has found quite frequently after death following some time after an attack of measles—a condition which he thinks has been too commonly ascribed to tuberculosis. This supposed frequency of tuberculosis after measles has been attributed by some observers to a predisposition to tuberculous infection produced by a diminished resistance created by the morbillous disease; or, as Birch-Hirschfeld has suggested, latent tuberculous lesions existing before the attack of measles has taken on an increased activity because of the mobilization of tubercle bacilli under the influence of the eruptive disease.

The careful observations of the author have failed to confirm this generally accepted opinion. In several instances, indeed, tuberculous lesions were found, principally of the lymphatic ganglia, but in not one of the cases did he observe an extension of the process to the lungs or to other organs, even in children who succumbed long after their attack of measles. In nearly all the cases terminating fatally he found pneumonia, either alone or accompanied by lesions of other organs (diphtheria, noma, enteritis).

The following forms were encountered:

1. *Broncho-pneumonia* of the ordinary type encountered in infectious diseases, which does not depend upon the etiologic agent of the primary disease.
2. *Croupous pneumonia*, which is an accidental complication in the course of the disease.
3. *Hemorrhagic pneumonia.*
4. *Pneumonia ending in suppuration* of the lung.
5. *True caseous pneumonia*, with constant presence of tubercle bacilli.
6. *Pneumonia with giant-cell formation*, but without tubercle bacilli.

The first five forms are well known and present no feature of special interest. The sixth form differs from the others, both to the naked eye and in its microscopical appearances. It resembles caseous pneumonia, clinically, in its chronic course, and anatomically, in the appearance of the parts invaded by the process. Anatomically, two forms of this phenomenon may be distinguished. In one are found granular foci resembling tuberculous nodules; the second form, observed when the disease has developed during a comparatively long period, resembles caseous pneumonia or a focus of atelectasis. Often, beside the pneumonia and the reactionary lesions of the pleura, there are bronchiectases and emphysema, always bronchitis and enteritis.

The histologic lesions of this form of pneumonia resemble either those of a muco-purulent inflammation or those of muco-proliferative inflammation. Its principal characteristic is the existence, in the midst of the foci, of the giant-cells of Langhans. The bacteriology of this form of pneumonia is not constant. In the foci the author has found pneumococci, streptococci, staphylococci, and the bacillus pyocyaneus, either isolated or in association; in the cases complicated by diphtheria, bacilli identical with the bacilli of Loeffler were present. The fact, however, is insisted upon that in none of the cases were tubercle bacilli found, either by microscopic examination or by animal inoculation. Moreover, when sputum of rubeolous patients suffering from capillary bronchitis or pneumonia was injected into the veins of rabbits, pulmonary lesions were produced which resembled caseous pneumonia, but in which no tubercle bacilli could be found. These lesions appeared only when the animal did not succumb to pneumococcic septicæmia; and when animals were used which had been more or less immunized against the pneumococcus no specific microbes were found in these foci of experimental pneumonia. After discussing the hypotheses which could be advanced to explain this form of pneumonia, the author gives the following as the most probable: When such patients die early the autopsy reveals an ordinary pulmonary inflammation; or, if they survive the pulmonary infection, the organism becomes slowly immunized against the pneumonic toxins, and recovery may take place. But as the organism has been enfeebled by the morbillous poison, the absorption of the exudate is imperfect, because of the emphysema and the turgescence of the lung. The exudate and the bacteria whose toxins have immunized the organism are not eliminated, remain in the affected parts, and react upon the tissues as foreign bodies, giving place to the formation of giant-cells and provoking a proliferative inflammation.

This hypothesis explains the subacute or chronic course of this form of pneumonia and the rapid emaciation of the patient—two facts which have

largely contributed to the confusion of this peculiar form of post-morbillous pneumonia with true caseous pneumonia.

The Effects of Bathing upon the New-born Infant.—CZERWENKA (*Wiener klinische Wochenschrift*, 1898, No. 11) has studied a series of 400 new-born infants, half of whom were bathed regularly after birth; the other half were not bathed. He found that bathing did not materially interfere with the desiccation of the cord, since the latter fell during the first seven days in 80 per cent. of those bathed and 94 per cent. of those not bathed. The danger of infection of the umbilical wound is not great, since it was observed only once in the two hundred cases. As to increase of weight, independently of the conditions of alimentation, the average has been found to be slightly greater among the infants who were bathed than among those who were not. The author concludes that regular bathing should be practised from the time of birth.

A Fatal Case of Poisoning by Bromoform.—MULLER (*Münchener medicinische Wochenschrift*, 1898, No. 38) reports a fatal termination from accidental poisoning by this drug in a child of two years. During the absence of the mother, the child had gained possession of the bottle containing about six grammes of bromoform and had emptied it. A few minutes later he exhibited symptoms of drunkenness. Emesis was provoked, but he soon fell into a profound slumber interrupted by general convulsions, which were accompanied by arrest of respiration and cyanosis of the face. The physician, who arrived two and a half hours later, found the child scarcely breathing, the eyes closed, the face pale and bluish, the pulse running, the hands cold, the pupils contracted, and the muscles relaxed. When removed from the bed another convulsion occurred. The stomach was washed out with great difficulty, the contentss melling strongly of bromoform. Removal of the tube was followed by convulsion, with cessation of respiration and arrest of the heart. Artificial respiration proved unsuccessful.

At the autopsy the stomach and duodenum were greatly congested and contained bromoform, chemical analysis yielding more than a gramme of the drug. Traces were found in the blood and in the viscera. The principal lesions were a liquid state of the blood, which was dark red in color, and a marked congestion of the viscera, particularly of the brain and its membranes. Death appeared to be due to asphyxia.

Noma Pudendi due to the Loeffler Bacillus.—FREYMUTH and PERTUSCHKY (*Deutsche medicinische Wochenschrift*, 1898, No. 14) report a case of gangrene of the vulva, perineum, and thighs in a child of three years, occurring three days after admission to hospital with the classical symptoms of measles. Bacteriological cultures of the affected area showed the presence of diphtheria bacilli, and an injection of antitoxin was accordingly made and repeated on the following day. Twenty-four hours later the reparative process began and continued without interruption. Six days after the second injection membrane appeared on the tonsils, but yielded readily to one injection of serum and disappeared after forty-eight hours. Recovery followed.

Tuberculous Peritonitis Apparently Cured by the X-rays.—AUSSET and BEDART (*Annales de Médecine et Chirurgie Infantiles*, December, 1898, p. 870) report the case of a child suffering from tuberculous peritonitis, with effusion, that was apparently cured after several exposures to the Röntgen rays. Previous to this treatment three punctures and a laparotomy had been made without distinct result, the effusion reproducing itself more and more rapidly. The patient was then subjected to the rays from a Crookes' tube about once a week. After the third exposure an exploratory puncture showed that the effusion was hemorrhagic, instead of a clear, yellowish color. Two and a half months later there was marked gain in weight, and the abdomen, while still a little large, was quite supple.

Broncho-pneumonia.—SAMUEL WEST (*British Medical Journal*, 1898, No. 1952) concludes a thoughtful paper upon this subject with the following propositions:

1. That the primary and secondary broncho-pneumonias have a different bacteriological origin.

2. That secondary broncho-pneumonia is for the most part due to streptococcus infection derived from some source in connection with the air-tubes, throat, and mouth.

3. That primary broncho-pneumonia is of pneumococcal origin.

4. That pneumococcus inflammation occurs with almost equal frequency in the child and the adult.

5. That pneumococcal inflammation takes a different form in each—in the adult producing massive consolidation, and in the child disseminated patches of consolidation; in other words, that there are no real pathogenic distinctions between lobar pneumonia of the adult and primary lobular pneumonia of the child.

The author is therefore convinced that the term "broncho-pneumonia" would be best reserved for those inflammations of the lungs which follow antecedent affections of the bronchi, and that their exciting cause, for the most part, will be found to be other organisms than the pneumococcus; while, on the other hand, the primary broncho-pneumonia of children is really croupous pneumonia occurring in a disseminated and patchy form instead of a massive consolidation.

A New Clinical Sign in Scarlatina.—MEYER (*Presse Médicale*, 1898, p. 119) describes a clinical phenomenon in scarlatina which has never before been mentioned, probably because the disease has been ordinarily studied among children. In the most characteristic instances this sign consists in a paresis of the extremities, the patient complaining that he cannot move the hands or feet. This degree of disturbance, however, is very exceptional. Most frequently there is only a numbness of the hands, with sensations of tingling or formication. Numbness may be absent, and then the patient experiences pricking sensations localized in the extremities of the fingers or in the palm of the hands. Disturbances in the feet are of rarer occurrence; they may be noticed alone or in conjunction with those described in the hands.

This sign appears during the period of eruption, exceptionally before it.

Its duration is very variable; it may be experienced for only a few minutes, and not be felt again. In the majority of cases it is more durable, appearing several hours or a day after the beginning of the eruption and persisting for two or three days, ordinarily with interruptions. It may even be delayed in its appearance until the third, fourth, or fifth day of the eruption. It is accompanied by no painful sensation. Some patients experience this disturbance only when they wish to use the hands; others at the moment of leaving the cold bath or when the hands are dipped into water.

This sign is very constant; the author has observed it in seventy-nine out of one hundred cases among adults in the Hôpital de la Porte d'Aubervilliers. Among several children it was observed once, in a boy of seven years.

In obscure cases this sign may be of value in diagnosis. It may also serve to determine a retrospective diagnosis in patients who have presented no eruption and in those whose desquamation is fugacious or delayed.

The author has not encountered this sign in other eruptive diseases; it is absent in the eruptions of la grippe, in simple or diphtheritic anginas, in toxic or drug erythemata, notably in mercurial erythema, the diagnosis of which is often quite difficult.

SURGERY.

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The Treatment of Pyloric Stenosis.—TUFFIER (*La Presse Méd.*, February 9, 1898), in discussing the treatment of pyloric stenosis, lays special stress upon the employment of gastro-intestinal anastomosis for all varieties of this condition, no matter what their cause.

He does not consider that the only indication for operation is where the patient's life is so endangered that nothing else will avail; the operation should not be too long delayed, no matter what the cause. The diagnosis is sometimes difficult, but it should be made as soon as possible. Incoercible vomiting, progressively increasing pain and enfeeblement that are rebellious to all medical measures are sufficient indications for operation. Dilatation of the stomach he does not consider an indication unless it is accompanied by marked stenosis and the accompanying symptoms.

As operative measures he relegates divulsion, or Loreta's method, to the treatment of cases of spasm. Stenosis by adhesions and bands pure and simple is of rare occurrence, and is generally accompanied by other conditions that require a gastro-intestinal anastomosis to relieve them completely.

Pyloroplastic operations, except in cases that are not very marked in character, require anastomosis to be done, either at the time or later by a second operation, to make them efficient. Gastro-enterostomy is the most frequently indicated operation; it creates a deviation in the course of the contents of the stomach from the old way and reduces irritation at the pylorus.

The author prefers to make the anastomosis in the posterior wall of the stomach at the most dependent point, and also prefers the use of a simple suture in two rows, employing an ordinary sewing-needle; he makes an opening that will admit his index-finger. This operation he can complete in thirty minutes, and he believes it is more certain and secure than plates or mechanical contrivances.

The removal of the pylorus he believes should be applied only to cases of malignant nature, but the simple entero-anastomosis in inoperable cancer cases is a much better surgical procedure than the formation of an artificial anus in cases of cancer of the intestines.

His operations have been very successful in their effects upon the patients, and he has seen the new orifice so assume the function of the pylorus that when the stomach was inflated with air none of it escaped into the intestine.

Pylorectomy.—In a paper in which he reports two successful pyloroplasties, MORISON (*The British Medical Journal*, February 19, 1898) points out the fact that the blood-supply of the small intestines is derived from the mesentery by small, straight transverse vessels, the anastomosis is fair near the mesentery, but very poor and sometimes entirely wanting on the convex surface of the intestine, hence sloughing is more likely to occur at this point. This should be remembered in planning all operations, and the blood-supply should be interfered with as little as possible.

In the pyloroplastic operation which he has employed he made a longitudinal incision in the anterior wall of the duodenum about one inch in length. In this way its edge was made more nearly equivalent to that of the pyloric end of the stomach, and the coaptation of the two was rendered more easy, while the blood-supply was not interfered with.

The coaptation is facilitated by the introduction of four temporary sutures. A continuous catgut suture is introduced through the entire thickness of both the wall of the intestine and that of the stomach, including all the coats. This secures a water-tight joint. Peritoneal adhesion is secured by a second row of interrupted sutures which include the peritoneal and muscular coats only.

Traumatic Affections of the Liver.—In discussing the treatment of traumatic injuries of the liver, WARING (*British Medical Journal*, March 19, 1898) gives the following as the clinical conditions which he considers may form indications for the performance of a surgical operation for the removal of a portion of that organ.

1. Carcinoma of the gall-bladder, in which the disease has not extended beyond the gall-bladder and the adjacent portion of the liver and there are no signs of secondary growths either in other parts of the liver or in other viscera.

2. The presence of a localized non-malignant tumor of the liver, such as

angioma, angiofibroma, fibroma, or adenoma, which is increasing in size and is giving rise to trouble.

3. The presence of a localized hepatic tumor which is due to a mass of echinococcus multilocularis.

4. Congenital hernia of a portion of the liver in which the herniated portion cannot be returned within the abdomen.

5. Sarcoma, primary in the liver, occasionally occurs, and has been treated by excision. In one case the patient was alive two years afterward, and in the other the disease recurred in a few weeks and the patient died.

Primary carcinoma of the liver is exceedingly rare. If it is in the form of a localized tumor, an attempt may be made to remove it. The liver is frequently the seat of secondary malignant growths, but operation is contraindicated in such cases.

The author states that his original researches on animals and the study of the results produced in reported cases have led him to the following conclusions:

1. That the dangers of hemorrhage after removal of portions of the liver have been much exaggerated.

2. That the best method of controlling and arresting hemorrhage from liver tissue after it has been incised or torn is temporary compression of the vessels in the gastro-hepatic omentum, and then ligature of the divided vessels.

3. That when the liver is the seat of growths such as are classed as operable, a surgeon ought to be prepared to carry out an operation for their removal.

4. That the mortality which will result from operations of this kind is not greater than in many of the recognized abdominal operations, such as resection of the intestine.

The Employment of Rubber Gloves in Aseptic Operations.—FRIEDRICH (*Centralblatt für Chir.*, 1898, No. 17), in replying to queries and criticisms on his advocacy of these gloves in operations, says that he does not advocate their employment in all cases, but when an operator or an assistant has a wound on his hands that is not fully healed, the employment of rubber glove-fingers is not sufficient; in such case the whole hand should be covered. The employment of gloves in all operations would greatly retard the operator and destroy the fineness of his tactile perception, while complicating the aseptic technique. Friedrich has gloves wrapped up in a bandage and sterilized for one hour in a steam sterilizer. This bandage is cut with antiseptic instruments at the time of operation. The gloves are half filled with sterile water to facilitate the process of putting on; they are handled externally only with sterilized cloths or bandages. Greater tactile acuteness is secured by stretching the finger of the glove tightly over the finger. Sharp instruments and spicules of bone are the greatest dangers in their path.

The Operations for Goitre.—In discussing the operations performed in the Berne Clinic, WORMSER (*Rev. de Chir.*, April, 1898) summarizes Kocher's views regarding the indications for the different methods of operating, as follows:

I. Thyroidectomy is indicated:

1. For malignant tumors of the thyroid gland.
2. For acute or chronic struma.
3. For parenchymatous goitres (diffuse hypertrophies of the gland).
4. For polycystic goitres.
5. For multinodular goitres.

It is contraindicated, on the other hand, if there is no normal thyroid tissue present.

II. Strumectomy (intraglandular enucleation) is indicated:

1. In unilocular cystic goitres.
2. In isolated nodules situated in normal tissue, if they can be removed rapidly and without marked hemorrhage; but otherwise a thyroidectomy is indicated.
3. For large nodules situated in immobile goitres.

In reference to exophthalmic goitres, Kocher prefers ligature of three of the arteries at one time, and later of the fourth. Section of the sympathetics is, as yet, too new to warrant an opinion.

The Treatment of Pott's Disease.—After an historical discussion of the treatments that have been employed in this disease, GEVAERT (*Ann. de la Soc. Belge*, July 15, 1898) makes the following summary of the work which has been accomplished by the new method of forcible straightening as advised by Calot:

1. It is undoubtedly true that this method has dangers, some of which are: Death during the chloroform anæsthesia, epileptic tremors and contractions of the extensor muscles of the feet during the manœuvres, hæmatemesis during narcosis, rupture of an abscess with discharge into the pleura, and death; consecutive paralyses of the lower extremities and bladder; rapid generalization of tuberculosis; and operative shock, with chronic convulsions and death. Fourteen deaths have already been reported as the direct result of the operation.

2. Lesions are frequent, especially in the region of the gibbosity, and principally when the spinous processes have not been resected. The majority of surgeons now place their bandages in such a way as to leave an orifice at this point, thus avoiding pressure and ulceration.

3. Chloroform is not absolutely essential to the operation, and is always a danger.

4. Bandages that include the head, neck, and shoulders have many inconveniences. Ulcers on the head and shoulders may result, and the confinement of the patient is very uncomfortable, etc. In addition, it is often useless if a bandage is employed which covers the shoulders and supports the head. The Sayre apparatus is frequently used, reaching up to just below the shoulders and leaving the patient in the supine position.

5. Reduction is made easy by various forms of mechanical apparatus which exert traction and pressure. They are all based on the principle of extension. They facilitate especially the placing of bandages without a large number of assistants.

6. The diagnosis of the possibility of reduction can be made only by attempting it, thus determining whether anchylosis is present or not. The

majority of surgeons are of one accord in saying that great force should not be employed in making the reduction, and that anchylosis should not be broken when already established.

7. Persistent paralysis of the lower extremities is an indication for immediate reduction.

8. It seems preferable to wait for the healing of abscesses before commencing the treatment of the gibbosity.

9. Radiographs furnish valuable information relative to perivertebral ossifluent abscesses and regarding later ossification.

10. Regarding the influence of the location on treatment, the consensus of opinion shows that reduction and immobilization at one operation are only applicable to lesions situated in the dorsal region, chiefly in the median portion. In the sub-occipital and cervical, and frequently in the superior dorsal region, extension by apparatus is generally preferred. In the lumbar a Sayre's corset placed in position during the extension frequently suffices to correct the deformity.

11. With regard to age, it is sufficient to say that the lesion of Pott's disease is not generally most serious in adult patients, and that extension apparatus is badly supported by adults.

12. The majority of authors repudiate, at the present time, radical operative interventions: ablations, cuneiform resections, laminectomies, etc., as, also, palliative operations, such as resections of the apophyseal spines, ligatures of the spinous processes, etc.

13. Anatomical and pathological considerations prove to a certainty that the loss of osseous substance resulting from the separation of the vertebræ can never be filled by osseous tissues. This fact leads to the following general conclusions:

14. Recent cases of Pott's disease and those in which the gibbosity comprises only a few vertebræ are the only ones that can be treated by this method.

15. Pott's disease is cured in two ways: 1, by anchylosis of the vertebræ; and, 2, by a pseudo-anchylosis or synostosis of the posterior arches, the lateral spines and the posterior spinous processes. The latter method is the more frequent, and is the one which occurs after forcible correction. It is therefore absolutely essential to respect the posterior arches and not to weaken them by osseous resections or ligamentous excisions.

16. In very cachectic children redressement should not be attempted, nor should it in those who cough, in those who have abscesses or fistulæ, nor in those cases presenting evidences of degeneration of any of the internal organs.

17. Opinions differ regarding the necessity of keeping the patients in the dorsal decubitus, some authors preferring to allow them to wear apparatus and walk about.

Chronic Osteomyelitis of the Lower Extremity of the Femur.—MARCHANT (*Rev. d'Orthopédie*, May, 1898) reports an interesting and instructive case in which the patient has suffered from repeated attacks of tubercular arthritis of the knee. Rest in bed had, in the earlier attacks, always led to complete functional recovery. Later, it had been necessary to tap the joint,

and finally, when the patient came under the writer's care, an osteomyelitis of the lower extremity of the femur demanded operative interference. The bone was trephined and pus and necrosed bone removed. The patient made a complete recovery, but some time later, while under massage, felt a sharp pain that extended into the joint. This was in April; in December he was again admitted to the hospital, where it was discovered by the aid of the Röntgen ray that a fracture had taken place at the seat of the former operation. It was surprising that this fracture should have given so little annoyance, and that a pseudarthrosis should have persisted, without consolidating, for so many months. An operation would have been the treatment adopted by many surgeons, but fifty-five days of complete immobilization sufficed to produce firm bony union, as demonstrated by a skiagraph. It is a case that demonstrates the value of conservative surgery in appropriate instances.

The Immediate Correction of the Deformities Resulting from Pott's Disease.—GOLDTHWAIT (*Boston Medical and Surgical Journal*, July 28, 1898) gives the following as the conclusions which he has derived from his experience with this method:

It has been clearly shown that similar operations have been performed at different periods in previous centuries.

The operation, as simplified by the writer, has been performed in a number of cases, upon which the paper is based. An apparatus is described by which it is possible to accomplish the correction without the necessity of a large number of assistants, and which makes it possible to apply the plaster-of-Paris jacket with marked hyperextension of the spine. No unpleasant results have been experienced, and in five cases in which paralysis was present the recovery was almost immediate.

In cases which begin acutely the operation seems to promise a moderate diminution of the existing deformity, and with the method of after-treatment as advised it is probable that the course of the disease will be shortened and that the usual increase of the deformity will be avoided.

In cases in which there is marked deformity the operation is justifiable at times, in order to secure better respiratory and digestive action, as well as to improve the position of the spine. In these cases considerable relapse is to be expected, owing to the extensive destruction of the bones and the imperfect osseous repair which takes place in tubercular disease.

The Treatment of Vicious Positions of the Femur after Coxalgia.—PHOCAS (*Rev. d'Orthopédie*, September, 1898) summarizes his views on this subject as follows:

1. In spite of all the other therapeutic measures proposed for the bad positions following coxalgia, linear subtrochanteric osteotomy should be considered the operation of choice.

2. In certain particular circumstances mechanical correction or arthrectomies are procedures that may be advantageously employed.

3. Rarely other forms of osteotomy may be employed.

4. Subtrochanteric osteotomy may, in certain cases, be employed with advantage in the treatment of coxalgia in the course of its development.

5. Bilateral subtrochanteric osteotomy may be advantageously employed in cases of bilateral anchylosis of the hips, especially if the limbs are fixed in a crossed position.

The Curative Power of Antivenomous Serum.—CALMETTE (*British Medical Journal*, May 14, 1898), in referring to a criticism of the antivenomous serum which he has discovered and prepared, says that it antagonizes the action of all venomous poisons, and that the reason certain others have not secured results equally as good as his is that they have not taken into full account the difference in weight between the animals experimented upon, and have therefore not used the serum in doses proportionate to the weights and resisting power of the animals employed.

The author also maintains in the most emphatic manner, and in spite of adverse criticism, that the serum of an animal hypervaccinated against a very active venom can, when injected in a sufficient quantity, prevent the death of an animal inoculated with fatal doses of venom of other serpents.

The Cure of Extrophy of the Bladder by Cysto-colostomy.—TUFFIER (*Gaz. Hebdom. de Méd. et de Chir.*, July 14, 1898) gives the following details of an operation which he has performed successfully, with relief of this troublesome condition:

1. The entire mucous surface of the bladder is dissected free, with the exception of the vesical trigone and a small margin of mucous membrane. Special care must be taken in the upper portion, where the peritoneum is closely associated. Rigid sounds are passed into the ureters, which facilitates their dissection for some distance upward. The entire field of operation is then carefully protected by aseptic cloths.

2. The peritoneal cavity is then opened as low down as possible, the sigmoid flexure is drawn out with as little traction as possible, forming a hernia through the peritoneal opening, which is closed about it. The intestine is then opened by a longitudinal incision as if for an artificial anus.

3. The vesical trigone is then sutured to the borders of this opening, thus adding a portion of the bladder to the intestinal wall. Mucous membrane is sutured to mucous membrane and the muscular coat of the bladder to the sero-muscular coat of the intestine. Either silk or catgut may be employed.

4. The cutaneous and aponeurotic layers are then sutured together.

For a few days a fistula may persist from which fecal matter and urine are passed; it, however, will close spontaneously.

Four months after the operation the abdomen is completely healed, with a deep depression where the bladder had been. The urine passes entirely by the intestine. There is no abdominal pain, no sign of intestinal inflammation, and no pruritus ani. The patient has five or six stools a day without any inconvenience. The general health is good, and there is no indication of renal involvement. The condition resulting from the operation is therefore much to be preferred to that obtained by any other operative procedure.

Prostatectomy by Combined Suprapubic and Perineal Methods.—WATSON (*Boston Medical and Surgical Journal*, May 5, 1898) describes an operation in which both lateral lobes of an hypertrophied prostate were removed

through a suprapubic incision; this was made through the median line in the ordinary manner, after the skin and subcutaneous adipose tissue, which was present in a large amount, had been laid back by a crescentic incision extending from one anterior superior spinous process to the other, with its convexity downward and its middle point just above the upper margin of the symphysis pubis. An external perineal urethrotomy was performed to provide for subsequent drainage and also to bring the prostatic lobes better within reach from within the bladder by pushing them up from below by the finger-tip inserted in the perineal wound. After an incision through the mucous membrane and fibrous capsule a large fibroid growth was easily enucleated from each lobe. The suprapubic wound was drained by two tubes, after the bladder had been sewed tightly about them and the angles of the incision partially closed. The carbol packing in the bladder was attached to a suture and removed through the perineal incision. The patient was discharged, healed, at the end of the sixth week. The general health and local condition remained excellent at the time of the report.

The case is a striking example of the benefits that, in a certain number of instances, follow the operation of suprapubic prostatectomy, and which may be hoped for in a very fair proportion of cases when, as in the present instance, the surgeon has the opportunity of performing it upon a patient whose age and general condition are such as to lessen the risk of a fatal result of the operation (which must always remain a serious one) and whose bladder has not yet lost its expulsive power, or at any rate the capability of regaining it when the obstacle to the outflow of urine has been removed.

THERAPEUTICS.

UNDER THE CHARGE OF

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The Pharmacological Action of the Thyroid Gland.—Dr. Robert Hutchison states that the effect of the administration of this substance is to increase oxidation in the body. The products of the disintegration of the nitrogenous tissues appear in the urine almost entirely in the form of urea; uric acid and the xanthin-bases being neither regularly nor appreciably increased, while the products of the fat destruction are eliminated as carbon dioxide by the lungs and water by the kidneys, the last being largely increased. It is probable that the increased elimination of nitrogen is due to destruction of the circulating proteids, and that the fixed proteid tissues are attacked only when the store of fat has been considerably diminished. The practical inference is that in treating patients suffering from obesity the diet should not be much restricted, and especially that nitrogenous matter

should be abundantly represented in it. Whether the remedy acts directly upon the tissues or only through the medium of the nervous system, its essential nature would seem to consist in a hastening on of the life-history of the cells. Increased rapidity of the action of the heart is, perhaps, the most constant of the effects observed from thyroid administration; often there is noted also irregularity, palpitation, or even threatened failure. Therefore, caution is necessary if the patient is debilitated, and especially in cases of obesity if the fatty change has affected the heart. The active part of the thyroid has no effect upon blood-pressure. The fall which occurs when decoctions of the gland are used is due to the action of organic extractives. In the blood it produces a physiological leucocytosis and diminishes hæmoglobin; the latter effect may be counteracted by simultaneous administration of iron. Later observations show that the effect on the red blood-corpuscles is only brought about by large doses. The active principle (iodothyrin) appears to be excreted entirely by the kidneys, and this excretion continues for several days after the administration of it has ceased. Whatever preparation is employed it is best to give it in small doses and frequently, rather than in large quantities at longer intervals.—*British Medical Journal*, 1898, No. 1959, p. 142.

The Use of Xeroform in Dermatology.—Dr. Ehrmann reports the results of the use of this remedy [tribromophenol bismuth] upon 210 patients. Externally it was employed for balanitis, moist eczemas, traumatic genital erosions, eczema of the anus and buttocks, and for that caused by iodoform. Various suppurating and gangrenous processes were treated: venereal ulcers, ulcers of the leg, tuberculous ulcers of the nose and penis, phlegmons of the hand, suppurating buboes, and incised furuncles. It was also employed for septic operations. In the last it was used to cover the closed incision, and as a gauze, held in place by retaining bandages. For suppurating wounds it was efficient in checking discharge and promoting early growth of skin. The frequent use of the remedy is not advantageous, for a too strong crust prevents discharge. The remedy was of especial value in surface diseases characterized by excessive secretion, of which balanitis is an instance. Then the remedy was superior to salicylic dusting powder in that it is not caustic, quickly destroys the odor, and finally permits regeneration of normal epidermis. Internally administered, it has proved of benefit in anal eczema, this symptom being so frequently associated with habitual constipation, intestinal atony, and marked flatulence, an intestinal antiseptic is required. Thirteen instances have come under observation of both external and internal use of this remedy. The constipation was relieved in all save two, and in these the flatulence was lessened. The chronic urticarias as well as other dermatoses of autotoxic origin are benefited by the use of this intestinal disinfectant. Of twenty-five patients treated, twenty-three were cured.—*Wiener medicinische Blätter*, 1898, No. 22, S. 343.

When Should Mercurial Treatment be Commenced in Syphilis?—Dr. Neumann believes that the preventive treatment of syphilis by mercury may be briefly disposed of as valueless so far as the destruction of the virus is concerned, for we know as yet of no drug that will produce constitutional

immunity, though mercury will doubtless inhibit and modify syphilitic infection for a season. The cardinal object in our symptomatic therapeusis is to subdue or avert the morbid phenomena. From this it follows that the period of administration of a drug such as mercury should be such that the constitutional effects of the disease may be most powerfully combated at the very outset. As to how long mercurial treatment is to be continued, the answer is made that it should cover a definite period after the recession of all visible signs of the disease, and this is the most practical means of preventing a recurrence of the disease. The author has found that the disease is not only less liable to recur, but the tertiary symptoms, as well as the chronic intermitting conditions, are greatly modified, while superfluous saturation with the drug is avoided. Mercury should not be administered before the appearance of constitutional symptoms, for these are not prevented, nor, indeed, is the disease as a whole mitigated. A further objection to this preventive form of treatment lies in the loss of efficacy which is entailed by the early use of the specific potency of mercurial administration. In fact, there is no drug yet known which will act as a preventive of constitutional syphilis, nor avert the manifestation of symptoms at variable periods, although there are a few exceptions to this general assertion. Further, mercury and the iodides are specific antisyphilitic remedies that modify syphilitic products, but do not destroy the virus.—*Medical Press and Circular*, 1898, No. 3087, p. 1.

Casein Ointment in Dermatology.—M. RABY states that this is: Casein, 14; alkalies, 0.43; glycerin, 7; vaseline, 21; antiseptic, 1; water, a sufficient quantity to 56-57. It is in appearance a white cream, of sufficient consistency, absolutely neutral, and spread over the skin forms, in a few minutes, a flexible and resistant varnish, which is removed simply by washing. Its principal advantage lies in its containing a considerable amount of vaseline, and with it can be incorporated a number of drugs. The alkalies, salts of alkaline reaction, and ammonium sulpho-ichthyolate thicken the ointment, and then it is necessary to add water or diminish the proportion of casein. Acids can be added only in small amount, because they coagulate the casein; but, nevertheless, 1 per cent. of salicylic acid can be incorporated. The hydroxyl derivatives of benzol, as resorcin and pyrogallol, liquefy the casein ointment, but they do not prevent the formation of a varnish upon the skin. The following combinations can be made: 1. Pyrogallol, 10 per cent. 2. Resorcin, 2; zinc oxide, 10 per cent. 3. Precipitated sulphur, 5; zinc oxide, 10; water, 10 per cent. 4. Ammonium sulpho-ichthyolate, 10; resorcin, 1; water, 10 per cent. 5. Tar, 10; water, 10 per cent. 6. Coal-tar, 10 per cent. The casein of commerce seems to be satisfactory. Pure casein is ten times more expensive, but does not give a sensibly better product.—*Nouveaux Remèdes*, 1898, No. 22, p. 505.

Treatment of Fissures of the Nipple with Orthoform.—DRS. CH. MAYGRIER and R. BLONDEL have made use of three methods: 1. Moist dressing. The powdered drug is applied directly to the fissure, and over this are placed compresses of sterilized gauze dipped in sterilized water or boric acid solution and expressed, the whole covered with waterproof tissue. After nursing the dressing is replaced. 2. Dry dressing. This is simply the substitution

of dry, sterilized gauze. 3. Alcoholic dressing. This consists of the application of a few drops of a saturated solution of this drug in 80° alcohol to the fissure and the use of a dry compress. Of these the last is preferable, although all have given good results.—*Revue de Thérapeutique Médico-chirurgicale*, 1898, No. 23, p. 797.

Ozæna Treated by Antidiphtheritic Serum.—Dr. Fernand Cathelin considers that this disease is produced by the bacillus of Loewenberg. In the instance reported the injections were continued for seven months, with an interval of one month, the total amount used being sixty-three drachms. Local treatment, as douches containing antiseptic substances, must not be neglected. The success obtained warrants further trial of this method.—*L'Echo Médical du Nord*, 1898, No. 46, p. 361.

Marmorek's Serum for Facial Erysipelas.—Dr. J. L. André reports five instances of its use. In all these instances the results were satisfactory. Complete and final decline of temperature to normal was observed save after one injection. This fall is rapid, and not by lysis. The remaining of the temperature at a low level proves either that the influence of the serum extends over several days or that the effect of a single dose develops a change in the system which persists a certain time. If this small number of observations shows anything it is that the injections should be repeated at forty-eight hour intervals. That the erysipelas may continue its evolution while the temperature remains normal was demonstrated in one instance, when, although the temperature fell, the cutaneous signs—redness and swelling—persisted for several days, but becoming less day by day. In general, however, all signs disappeared as the temperature fell. The injections are usually harmless; local pain is rare; the urine is unchanged in quantity and quality, and albumin does not appear. The serum employed varied in age from two to fourteen months. The older is less active; that of eight months always gave positive results, not immediate, it is true, but rapid and certain.—*Archives de Médecine et de Pharmacie Militaires*, 1898, No. 11, p. 340.

Injections of Calomel in Lupus Vulgaris.—Dr. Berntheim reports a single instance. This patient had been unsuccessfully treated for several years by caustics, scarification, curetting, and tuberculin. At eight-day intervals injections of twelve minims of 10 per cent. emulsion of calomel in olive oil were made. After eight injections distinct decrease in the hyperæmia was observed. A few weeks later all ulcerations were healed, the skin became thin, pale, and normal, and cure was reached in three and one-half months.—*Münchener medicinische Wochenschrift*, 1898, No. 46, S. 1468.

Treatment of Gonorrhœal Arthritis.—Dr. Loewenhardt administers equal quantities of salol and sandal-wood oil in gelatin capsules, thrice daily, five to ten grains at a dose. The urethral disease must be treated. The joints must be kept at rest, but plaster-of-Paris dressings are to be avoided. The most effective applications are those characterized by a high degree of heat—sand-bags, or natural hot-spring baths, or a hot-air apparatus maintaining a temperature of 212° to 302° F. without disturbing the patient.

The retrogression of the disease is marked and due to the sensitiveness of the gonococci to heat. Apparatus adapted to each affected joint can be made cheaply, so that recourse to commercial machines is entirely unnecessary.—*Münchener medicinische Wochenschrift*, 1898, No. 45, S. 1449.

Infiltration Anæsthesia —Dr. Paul Heinze found that distilled water is absolutely useless as a local anæsthetic on account of the preliminary irritation of the sensory nerves that it occasions from the swelling of the cells by imbibition. Salt-solutions less strong than 0.6 per cent. cause imbibition by the cells and swelling; those of 2.5 per cent. and upward cause dehydration. Sodium chloride in 0.2 per cent. solution is very painful to inject, and the anæsthesia therefrom is not complete. Sugar solutions have no specific effect upon the sensory nerves, and potassium bromide is an intense irritant, while methyl-violet and blue are still more unsuitable. Caffeine and its salts belong to the class of painful anæsthetics, and their depressant action on the sensibility of the cutaneous nerves was found to be very slight. Carbolic acid is efficacious so far as its local action is concerned, but there is danger of gangrene. Cocaine in 0.02 per cent. solution is very painful, and a tender, red infiltration is left behind. Morphine causes some anæsthesia, and all solutions are accompanied by more or less violent paræsthesias. A 0.1 per cent. solution acts precisely as distillled water. It is active as a local anæsthetic only in the stronger solutions, and always causes intense local irritation. The solutions known as Schleich's are efficacious only on account of the cocaine which they contain. Acetanilid and antipyrin solutions are painful and useless, and guaiacol is equally inapplicable. Eucaine in watery solution causes uncomfortable sensations that may amount to pain, and it cannot replace cocaine. As for beta-eucaine, its solutions are of equal value with the same percentages of cocaine, because the osmotic tensions of the two drugs are about the same. The irritant effect of the former is even less. It is less toxic, not decomposed on boiling, and therefore can be sterilized. Orthoform is readily decomposed by even careless warming, and is hardly practicable for the purpose. Beta-eucaine is the remedy of choice, because it is less irritant, while being the equal of cocaine in anæsthetic effects. The following solution, warmed to body-temperature when used, is stable and can be sterilized by boiling: Beta-eucaine, 1; sodium chloride, 8; distilled water, 1000.—*Archiv für pathologische Anatomie, Physiologie und klinische Medicin*, 1898, Heft 3, S. 466.

Intravenous Injections of Normal Saline Solution.—Dr. Horace Tracy Hanks makes use of intravenous injections of normal saline solution for loss of blood from any cause, from severe traumatism, and for the early stage of sepsis after an operation, and for the suppression of urine and obstruction of the bowels from paralysis. A practical method is a common-sized teaspoonful of table-salt in a pint of pure water, the whole to be boiled for one-half hour, and filtered through several thicknesses of a sterilized towel and kept in closed bottles, well corked with cotton, and this cotton properly protected with a bit of c'ean gauze. A two-quart bottle should be filled with this solution and kept at a temperature of 115° to 118° F. by a towel wrapped about it, upon which hot water is poured as frequently as is

necessary to maintain this temperature. With the rubber tubing, glass connections, stop-cock, and a probe-pointed aspirating needle of suitable size, the apparatus is complete. Its simplicity warrants the more frequent employment of this method.—*American Gynecological and Obstetrical Journal*, 1898, vol. xiii. p. 233.

The Action of Formol Upon the Thyroid Gland.—M. LÉPINOIS suggests this substance in 1 per cent. aqueous solution for the preservation of thyroid glands intended for therapeutic purposes. He concludes: 1. This solution keeps them fresh and renders them unchangeable even if they are in the form of pulp. In the latter case a small quantity of glycerin should be added and the divided masses covered with a thin layer of gelatin, to prevent complete desiccation. 2. This treatment does not notably modify the chemical composition of the thyroid gland so far as the iodine-containing albuminoids are concerned, and their solubility in pure or salt water is hardly diminished. 3. Digestion of the gland is unaffected, and this and the preceding observation lead to the belief that their therapeutic activity is preserved.—*Bulletin Général de Thérapeutique*, 1898, t. cxxxvi. p. 655.

The Treatment of Diabetic Coma.—DR. ALBERT ROBIN, remarking upon the clinical forms (cardiac, dyspnœic, and nervous), formulates the following. 1. Stop all anti-diabetic *régime* and put the patient upon a milk diet. Avoid ill-considered medication, be doubly watchful at the first onset of slight intercurrent diseases. 2. Increase elimination by the bowels of poisons retained in the organism—for example, by an ounce of sodium sulphate. 3. To saturate the acids of the organism each day, give five drachms of sodium bicarbonate. 4. Watch the heart; if the pulse is small, rapid, or irregular, administer infusions of digitalis and ergotin to contract the peripheral arteries. If the pulse is slow, soft, and very compressible, give subcutaneous injections of citrated caffeine and by the mouth theobromine in forty-five grain doses. 5. To relieve the digestive disturbances and to increase the tolerance for milk administer before each portion of milk a small amount of strychnine sulphate, and after it a powder composed of five grains of pepsin and two of maltine [diastase]. To prevent lactic-acid fermentation without interfering with digestion, one-fourth of a grain of ammonium fluoride, well diluted, is recommended. 6. Two injections each day of a 25 per cent. solution of sodium glycero-phosphate are advised. 7. Energetic friction should be practised over the whole body with a stimulating liniment. 8. Large quantities of oxygen should be inhaled. If this treatment is commenced at the moment premonitory symptoms of coma appear, it frequently will ward it off. In the presence of actual coma treatment is unavailing.—*Bulletin Général de Thérapeutique*, 1898, t. cxxxvi. p. 353.

The Treatment of Neuralgias.—DR. HAMM recommends the spraying of ether upon the painful areas of neuralgia and headache. In some instances the spray has been so long continued that a pellicle of ice formed upon the skin, but no untoward results followed. In frontal headache, when seven grains of antipyrine had failed, one application relieved the pain.

Relapses are not frequent. This method is recommended as simple, cheap, and practical.—*Therapeutische Monatshefte*, 1898, Heft 10, S. 549.

The Use of Asaprol in the Treatment of Typhoid Fever.—M. CLEMENTE FERREIRA thinks that the intestinal lesions are the result of the action of the toxin circulating in the system invaded by the germ of Eberth, which elaborates a virulent poison which causes the material alterations and morbid phenomena which go to make up the picture of this disease. It follows, then, that the leading purpose of the use of topical disinfectants, the insoluble antiseptics—*i. e.*, direct action upon the germs in the intestine—lacks scientific foundation. The soluble antiseptics should therefore receive consideration. For this reason the use of calomel in small doses, which are thus converted into soluble mercurial compounds, acts more efficiently than an insoluble salt. Six patients have been under observation treated by this remedy, which is calcium-naphtol or monosulphonate, and all shared its beneficial effects as regards temperature, general conditions, and the course of the disease. Thirty to forty-five grains were given each day either in solution or cachets in two-hourly doses. If diarrhœa persists, bismuth subnitrate or chalk is added. Besides the results of clinical observation, the agglutinating action which this agent exercises upon cultures of the bacillus has been demonstrated, and furnishes a cogent reason for its exhibition.—*Bulletin Général de Thérapeutique*, 1898, t. cxxxvi. p. 581.

Bismuth-chinolin Rhodonate.—DR. L. FORCHHEIMER recommends this substance $(C_9H_7N.HSCN)_2\,Bi\,(SCN)_3$, which is a large-grained powder of a reddish-yellow color, insoluble in water, alcohol, or ether. When this is placed upon an ulcer, if the secretion is abundant, a paste is formed; if this is scanty, a very adherent crust is produced, under which the ulcer generally heals. Rather infrequent dressings (four to six days) are preferable. Before redressing a local bath should be administered to facilitate the removal of the crusts. Sometimes, particularly in women, the powder causes pain, of which the reason is not apparent. In ulcers of the leg, whether varicose or syphilitic, in venereal ulcers, and acuminate condylomata the healing is prompt and certain, owing to the antiseptic and drying properties of this substance.—*Therapeutische Monatshefte*, 1898, Heft 8, S. 445.

Endermol.—DR. MAX WALTERS reports upon this substance, especially in the treatment of scabies. This is nicotine salicylate ($C_{10}H_{14}N_2$-$C_7H_6O_3$), and occurs as colorless, transparent crystals easily soluble in water and most organic solvents, and has a slight burning taste. It may be employed as a 0.1 to 1 per cent. lanolin ointment, 5 per cent. in oil and traumaticin, or a 0.1 per cent. in sapo viridis. Of sixty-seven patients treated by preliminary baths and soap inunction sixty-four were cured and the itching disappeared after one application. The remaining three required six treatments. In three instances relapses occurred from sleeping in unclean beds. Absolute security followed from four applications, although fewer were effective. In young subjects some symptoms of nicotine-intoxication followed: headache, nausea, vomiting, palpitation, and dyspnœa.—*Therapeutische Monatshefte*, 1898, Heft 8, S. 443.

The Treatment of Cystitis.—Dr. T. Gordon Kelly had failed to find a perfectly reliable urinary antiseptic until he had employed hexamethylen tetramin, also known as urotropin. He reports three instances of its use, the last being the most striking. A gentleman, aged thirty-five years, had suffered from chronic cystitis, complicated by attacks of hæmaturia, of fifteen years' standing. Malignant disease and villous growths in the bladder, as causes of the hemorrhage, had been excluded. The opinion was finally reached that this resulted from a congestive cystitis set up by the great excess of mucus in the urine, which contained pus and was alkaline. Twenty grains of this remedy were administered twice daily, and upon the ninth day the urine became clear and upon the fourteenth free from pus for the first time in fifteen years. For a month fifteen grains were taken twice daily, then one-half this amount was given for four months, during which time no pus nor blood appeared in the urine.—*The Therapist*, 1898, No. 10, p. 130.

The Results of Serum Treatment.—Mr. W. E. Green, after adducing statistics showing the value of this treatment in diphtheria, particularly when adopted early, has collected 36 cases of tetanus treated by antitoxic serum, of which 25 recovered; 40 of puerperal fever and allied conditions, with 33 recoveries; and 11 of pneumonia with 9 recoveries. As regards prophylaxis, Semple relates that out of 84 persons vaccinated against typhoid fever during an epidemic not one contracted the disease; while of 120 unvaccinated under the same conditions, 16 were attacked by it. Inoculation with Haffkine's plague serum was practised in 5251 cases with a mortality of 1.75 per cent., while of 14,830 treated in other ways 20.6 per cent. died. The use of antivenomous serum promises equally good results, but those in tuberculosis so far are unsatisfactory. The last successes are those obtained by Sanarelli in the serum treatment of yellow fever.—*British Medical Journal*, 1898, No. 1960, p. 224.

GYNECOLOGY.

UNDER THE CHARGE OF

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Uterine Cough and Other Reflex Neuroses.—Schaefer (*Centralblatt f. Gynäkologie*, 1898, No. 31), at the conclusion of an article on this subject, summarizes as follows: In women who are predisposed, especially at the time of menstruation and during pregnancy, irritation of the mucous membrane of the upper third of the vagina may provoke the so-called uterine cough. Inflammatory conditions in the broad and sacro-uterine ligaments may give rise to similar reflex phenomena; fermentative processes and auto-intoxication doubtless predispose to these. In the same patients irritation of the vulva and lower third of the vagina is accompanied by purely local reflexes.

Uterine cough is due to irritation of the sensory filaments of the inferior

hypogastric plexus with its utero-vaginal plexus (supplying the vault of the vagina and portio), and the spermatic plexuses and hemorrhoidal nerves with their ganglia within the folds of the broad ligaments, provided that there exists already a pulmonary neurosis or predisposition. Irritation of the pudendal nerve, on the contrary, causes no distant reflex phenomena.

Reflex disturbances may be: (*a*) Physiological reflexes in distant motor and vasomotor regions; (*b*) impulses transmitted along nerves the resistance of which has been weakened by morbid changes; (*c*) irregular impulses due to a general nervous depression.

Tubercular subjects, or those with marked gastric symptoms, are especially liable to reflex cough.

In cases of uterine displacement in neurotic individuals these reflex disturbances are often promptly relieved by the use of pessaries, although general treatment is also important.

Histological Changes in the Vagina.—PRETTI (*Zeitschrift f. Geb. u. Gyn.* Band xxxviii. Heft 2), from studies of the minute anatomy of the vagina in thirty-two specimens, arrives at the following conclusions: Contrary to the statements of many writers, neither glands nor mucous follicles could be demonstrated in the lining membrane. The latter is not a true mucous membrane, but is a true inversion (Einstülpung) of the epidermis. The squamous epithelium becomes more and more flattened with advancing age, gradually diminishing in thickness from the vestibule toward the portio. The height of the papillæ does not depend upon the age of the subject, as the papillæ may be slightly marked in young women.

Extensive round-cell infiltration was frequently noted in the vagina when macroscopically it appeared to be perfectly normal. This is not to be regarded as necessarily pathological, but may be due to the irritation resulting from an acrid cervical discharge.

The Relations of Disease of the Adnexa to Retroflexion.—JAYLE and LIMA (*Remèdes Gynécol. et de Chir. Abdom.*, 1897, Nos. 11 and 12) discuss at length the question whether the symptoms accompanying uterine displacements are due directly to these or to coexisting disease of the adnexa. Out of 1100 cases of disease of the tubes and ovaries they selected 76 as suitable for careful study. Their conclusions are thus stated: 1. So-called latent retro-displacements, which give rise to no symptoms, were not observed in a single instance. 2. Painful retro-displacement is nearly always complicated with disease of the adnexa. 3. Mobility of the displaced uterus is not an indication that the tubes and ovaries are healthy. 4. Affections of the adnexa are usually more severe in connection with retroflexion than with retroversion. 5. The prognosis and treatment of uterine displacements bear an intimate relation to the extent of the accompanying tubal and ovarian trouble. 6. The extent of the lesions in the adnexa, together with the patient's nervous condition, are the principal factors to be considered in treating uterine displacements. 7. Simple reposition of the uterus, without further treatment directed to disease of the organ itself and of the ovaries and tubes, does not insure a cure. 8. Retro-displacement may cease to give rise to marked symptoms if the attending complications have been relieved.

9. Conservative (non-surgical) treatment of uterine and periuterine inflammation is greatly hampered by the existence of a displacement.

Pathogenesis of Osteomalacia.—MACEDONIO (*Arch. di Ost. e. Gin.*, 1897, No. 10) reviews the various theories of the etiology of this affection and adopts Fehling's—*i. e.*, that osteomalacia is to be regarded as a trophoneurosis of the osseous system, due to reflex irritation from excessive or pathological activity of the ovaries. Since, as Consentino has recently demonstrated, ovulation continues during pregnancy and lactation, it is easy to explain why the disease progresses so rapidly after conception occurs.

Castration offers a certain cure. The improvement in the general condition of the patient and the prevention of conception, in consequence of the operation, do not sufficiently account for the beneficial result.

FERRONI (*Ibid.*) compares the microscopical appearances noted in sections of ovaries removed from two osteomalacic patients with the minute changes present in the ovaries of rhachitic subjects. In the former, which were enlarged, the germinal epithelium was quite normal, the follicles not increased in number, and the corpora lutea normal. Small foci of hyaline degeneration were found in the cortex. The bloodvessels of the stroma were notably enlarged, the media and adventitia being much thickened, and their nuclei degenerated. Elsewhere the vessels were greatly dilated. Hyaline degeneration of their walls and also of the stromal connective tissue was often observed.

In the ovaries from rhachitics the cortex was normal, but in the stroma there were essentially the same changes as in the former specimens.

Glandular Elements in Uterine Fibromyomata.—LOCKSTAEDT (*Monatsschrift f. Geb. u. Gyn.*, Band vii. Heft 2) describes seven specimens of fibromyoma in which he found follicles or cysts lined with epithelium. The tumors were nearly all subserous and were attached in the neighborhood of the Fallopian tube, so that it seems to him more plausible to infer that the epithelial elements were derived from the glands in the tubal mucosa, rather than from remains of the Wolffian body, as inferred by Von Recklinghausen. He also opposes Orlof's view that the tumor may grow around and include epithelial pouches.

LEGNEN (*Ann. de Gynécologie; Centralblatt f. Gyn.*, 1898, No. 34) calls attention to the fact that epithelial cells are sometimes found between the muscular fibres and in the meshes of the connective tissue in fibromyomata, especially in those which are adjacent to the endometrium. These cells usually appear as single irregular layers, lining blind follicles. He believes that they are derived by proliferation of the glands of the uterine mucosa. Their presence explains the occurrence in these tumors of cysts with epithelial contents, and may throw some light upon the much-vexed question of the carcinomatous degenerations of fibromyomata.

Diseases of the Adnexa Following Vaginal Hysterectomy.—VAN DER HOEVEN (*Nederl. Tijdschr. v. Verlosk. en Gynæcol., Centralblatt f. Gyn.*, 1898, No. 35) discusses the question of the fate of the tubes and ovaries, or their remains, after removal of the uterus. He does not agree with Brennecke that

the ovaries undergo atrophy, the view being disproved by numerous observations both at the examining-table and during secondary cœliotomies. Existing disease of the adnexa may subsequently be cured, may remain stationary, or may progress, the first being the rule. On the other hand, pathological changes may take place in adnexa which were normal at the time of the operation, necessitating further interference. Cystic degeneration is most common, the writer having observed four cases of ovarian and parovarian cysts, and hydrosalpinx. Seven others are mentioned by different authors.

Massage in the Treatment of Post-operative Ileus.—HABERLIN (*Centralblatt für Gynäkologie*, 1898, No. 42) reports cases of intestinal obstruction after cœliotomy treated successfully by massage after the usual means had failed. He recommends abdominal massage, with change of the patient's position, soon after operation, in order to encourage peristalsis and to prevent intestinal adhesions. In case such adhesions occur, with evidences of obstruction, he believes that massage should always be tried in preference to reopening the wound. The fear of causing hemorrhage is unfounded, and there is no risk in tearing recent adhesions of injuring the gut. The only exception is in the case of adhesions which serve to wall off purulent foci. The pain attending the manipulations is not severe; even if increased it does not serve as a contraindication.

A loop of intestine adherent in Douglas's pouch or to a stump can be freed in this way; laxatives and enemata are to be employed at the same time, except in cases in which too active peristalsis is undesirable (as in incarcerated hernia). If a secondary cœliotomy becomes necessary the patient's chances of recovery are not jeopardized by the massage.

Tubal Menstruation.—THOMSON (*Centralblatt für Gynäkologie*, 1898, No. 45) reports two cases which serve to throw some light upon this disputed question, others having been published by Hofmeier, Terrillon, and Landsbery. In the first a fistula communicating with the tube discharged blood at every menstrual period, the hemorrhage beginning and ceasing with the commencement and cessation of the uterine flow. In the second case an abdominal fistula followed an operation for early tubal pregnancy. Eight months later the patient observed bleeding from the fistulous opening coincident with menstruation. This phenomenon was repeated several times until a silk ligature was discharged, when the fistula closed.

These clinical facts seem to confirm the observations of Martin and Leopold that during menstruation the mucous membrane of the tubes undergoes a change similar to that of the endometrium, though in a less degree. The same relative change in the tubes is noted during pregnancy and the puerperium.

Abdominal Hysterectomy with Clamps.—WOLFRAM (*Centralblatt für Gynäkologie*, 1898, No. 45) reports a desperate case of supravaginal amputation for the removal of a fibroid weighing thirty-five pounds, in which the patient was so weak and anæmic that it was necessary to operate as rapidly as possible. No ligatures were used, seven large and ten small clamps being attached to the broad ligaments, stump, and bleeding vessels. In closing

the abdominal wound the posterior peritoneal flap was brought up and sutured above the handles of the clamps, so as to shut off the stump from the general cavity. Iodoform gauze was then packed around the stump and forceps. The patient was under light anæsthesia only a little more than half an hour, and made a good recovery, the clamps being removed on the eighth (!) day, while the gauze was not entirely removed until eight days later. The course of the case was similar to that of one in which the stump had been treated by the extraperitoneal method, except that the usual necrosis of the tissues did not occur, since the stump itself was not strangulated. The patient left her bed at the end of three weeks.

Accessory Kidneys in the Broad Ligaments.—ROSSA (*Archiv für Gynäkologie*, Band lvi. Heft 2) describes two cases in which he discovered accessory renal tissue beneath the free border of the broad ligament in new-born infants. Further investigation led to the discovery of similar inclusions in adult subjects.

Microscopically these nodules appeared as groups of round or polygonal cells with large nuclei, without any interstitial tissue. In the centres of these non-vascular bodies were secondary cavities. The cell-groups had no capsule, and were in close relation to the endothelium of the peritoneum. They showed no evidences of any inflammatory process, and were doubtless the source of certain broad ligament cysts.

Sensibility of the Female Genitals from a Medico-legal Stand-point — CALMANN (*Archiv für Gynäkologie*, Band lv. Heft 2) cites a case in which the plaintiff accused a midwife of producing an abortion by inserting an instrument into her uterus. The defendant asserted that she had merely catheterized the bladder and afterward tamponed the vagina. It was decided that it was impossible for the plaintiff to tell simply from the subjective symptoms whether the catheter had entered the uterus or the bladder.

Calmann conducted a series of experiments upon eighteen women for the purpose of testing this point. It was found that the majority could not distinguish by their sensations alone whether the urethra or some part of the vagina was touched with an instrument, nor could they form any opinion as to their size or shape. Except when the bladder was full they were unable to tell when the urine was being drawn. They could not distinguish when a sound entered the cervical canal, especially in the case of pregnant women. Disinfectants, such as carbolic acid and bichloride of mercury, rendered the vaginal mucous membrane less sensitive.

Placental Polypi in the Fallopian Tubes.—FRÄNKEL (*Archiv für Gynäkologie*, Band lv. Heft 3) reports two cases of persistent metrorrhagia following tubal abortion. The affected tubes were removed, and in the middle third of each was found a typical placental polypus, identical in structure with those seen in the uterus under similar conditions. At the base of the polypus the wall of the tube was thin, the muscular fibres being absent. In one ovary was a corpus luteum cyst with a lining of flattened epithelium. Fränkel believes that these polypi are often present after rupture of a gravid tube, or tubal abortion, and, as in the case of similar growths in the

uterus, do not tend to become absorbed. The possibility of this condition should be borne in mind if fresh attacks of external or internal hemorrhages occur after recovery from a tubal abortion.

Intestinal Fistulæ Resulting from Clamps.—SCHILLER (*Zeitschrift für Geb. und Gynäkologie*, Band xxxviii. Heft 1), commenting on several cases of entero-vaginal fistulæ following hysterectomy with clamps, emphasizes the importance of not only guarding the intestine from injury during the application of the forceps, but also of carefully covering their ends with gauze after they are *in situ*.

Diabetes from a Gynecological Stand-point.—KLEINWACHTER (*Zeitschrift für Geb. und Gynäkologie*, Band xxxviii. Heft 2) has collected twenty-two cases bearing on this subject, 64 per cent. being women who had passed the menopause. Menstruation was diminished and irregular in four cases. There was no evidence of premature atrophy of the genital organs in any instance.

Pruritus of the vulva was present in 73 per cent., but there was no relation between the intensity of the irritation and the amount of sugar in the urine. In short, there seemed to be no change in the internal genitals referable to the diabetic condition.

OBSTETRICS.

UNDER THE CHARGE OF

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A Case of Labor Complicated by Contracted Pelvis, Double Uterus, and Septic Infection.—In the *Monatsschrift für Geburtshülfe und Gynäkologie*, 1898, Band viii. Heft 4, SCHÜTTE reports the case of a primipara who was admitted to his hospital in labor and who was found to have a flattened and obliquely contracted pelvis. It was impossible to tell whether the head would succeed in engaging, and accordingly the patient was given morphine to secure sleep. The fœtus was in breech presentation, its heart-sounds being plainly heard.

On the following day it was evident that the mother could not deliver herself, as she had rapid pulse and considerable fever. Accordingly, the child was removed by Cæsarean section, the uterus closed and replaced in the pelvis. The patient died shortly afterward from exhaustion.

On autopsy it was found that a double uterus and vagina existed in the case, together with the contracted pelvis. The patient had evidently been

infected by the midwife, who first examined her some time before her admission to the hospital. Although the child made several efforts to breathe, it could not be revived.

The Differential Diagnosis between Phlebitis and Lymphangitis of the Pelvic Organs, and the Prognosis and Treatment of Each.—In the *Zeitschrift für Geburtshülfe und Gynäkologie*, 1898, Band xxxix. Heft 3, THOMAS contributes a paper upon this subject, and reports a number of cases from Freund's clinic at Strassburg.

He draws attention to the anatomy of the pelvic lymphatics, and distinguishes three groups of lymphatic ganglia—one near the rectum, one near the ureter and spermatic artery, and one between the two. Should infection attack the lymphatics it will proceed in an ascending series through these ganglia.

The anatomy of the veins of the pelvis is clearly known, and attention has often been called to the readiness with which they are entered.

In diagnosticating between phlebitis and lymphangitis in cases of puerperal septic infection, the active onset, rapid course, and severe symptoms of phlebitis must be contrasted with the gradual progress of lymphangitis. In the latter weeks or even months may be consumed in a slowly moving infection which may cause exudate extending to the utmost limits of the broad ligaments and adjacent peritoneum. There may be little or no vaginal discharge, and if the patient's strength be maintained recovery is the rule.

In phlebitis, however, the patient has high fever and chills. There is a purulent vaginal discharge, the inflamed veins can sometimes be distinguished, and the result is often fatal.

As regards treatment in phlebitis, the extirpation of the infected focus is indicated if it can possibly be done. The writer described a case in which the abdomen was opened and the spermatic vein of one side dissected out, going down to the ureter. The operation failed, however, to save the patient's life. The uterus should be thoroughly curetted as early as possible, but should be disturbed as little as possible.

In lymphangitis a thorough cleansing of the womb should be made as soon as the case is seen, and in the gentlest possible manner. After this the treatment should be limited to stimulation, local applications of heat or cold to the lower abdomen, sitz-baths, and douches. In one of Thomas's cases an abscess formed near Poupart's ligament, but this was readily evacuated by incision.

Phlebitis is one of the most fatal forms of puerperal septic infection, while lymphangitis is the common form of sepsis, and when the latter occurs in patients in good condition a recovery may usually be expected.

The Etiology and Treatment of Osteomalacia.—SCHNELL (*Zeitschrift für Geburtshülfe und Gynäkologie*, Band xxxix. Heft 3) contributes an article upon this subject based upon cases observed in the clinic at Würzburg.

He divides the cases into the chronic and acute forms. He finds that the earlier in the life of the patient the disease occurs the more progressive is its character. The first pains in this disease are often felt in the pelvis.

In fourteen of these cases the ovaries were subjected to careful examination.

They were found atrophic, the bloodvessels enlarged, and hyaline with connective-tissue degeneration, and later hyaline degeneration in the cortex and about the follicles. The greatest changes in the ovaries were found in the severest cases of osteomalacia. The connection between the two conditions seems clearly shown.

As regards treatment, the removal of the ovaries was invariably followed by improvement. In some cases as soon as three days after operation the pains became less. Ten patients were treated with cod-liver oil and phosphorus, and improvement not especially marked was observed in these cases. General hygienic measures in the form of baths, tonics, and massage were in a sense useful, but not efficient. There is good reason to believe that the effect of removal of the ovaries is permanent in arresting the disease.

The Development of the Placenta.—KOSSMANN (*Zeitschrift für Geburtshülfe und Gynäkologie*, Band xxxix. Heft 3) presented to the Obstetrical Society of Berlin a demonstration of the development of the placenta. The following conclusions were drawn:

Immediately after the impregnated ovum enters the uterus a marked growth and development occur in the crypts of the endometrium. The syncytium replaces the nuclei of the endometrium, forming large vacuolated spaces as the epithelium is removed. The ectoblast of the ovum joins the syncytium. It is not attached to the connective tissue, but is covered with syncytium lying free of the crypts of the endometrium. The villi develop rapidly from the ectoblast, penetrating the lining membrane of the womb. The villi can scarcely be said to grow into the glands of the uterus, but penetrate partly into these organs. As soon as the allantois and the chorion develop the villi begin to develop in excess of the ectoblast. The maternal layer of the ectoblast is covered over with syncytium. The maternal blood passes in capillaries in the spaces between the villi and around the glands of the uterus, the decidual cells undergoing degeneration.

Automatic Beating of the Embryonal Heart Three Hours After Death.—A most interesting example of this extraordinary occurrence is reported by NEUGEBAUR (*Centralblatt für Gynäkologie*, 1898, No. 47). The case was one of ectopic gestation at about the fourteenth week. The embryo was living, and operation was undertaken to save the mother from the risks following rupture of the gestation sac. When the abdomen was opened it was impossible to separate the entire sac and to deliver the placenta. Accordingly the operator incised the fœtal sac and endeavored to extract the embryo. Upon grasping the head it separated from the body, and the spinal cord was drawn out of its canal with the head and brain. The embryo was removed little by little.

On opening the thorax the heart was seen beating in reflex peristalsis. No especial effort was made to place the heart under favorable conditions, but this extraordinary phenomenon was observed by the staff of the clinic for three hours. The sac of the embryo was packed with gauze, and the mother ultimately made a good recovery.

Experimental studies by physiologists have demonstrated the possibility of such an occurrence. It is rare, however, that the heart of the human

embryo comes under observation. Pflüger was astounded to observe beating of the heart in a human embryo twenty days old. This continued for an hour.

Treatment of the Stump of the Umbilical Cord.—In the *Centralblatt für Gynäkologie*, 1898, No. 47, BUDBERG describes his method as employed in the clinic at Dorpat. He has employed the method in two hundred cases, and finds it the best which he has yet tried.

It consists in wrapping the stump of the cord in cotton soaked with alcohol. When it is possible to obtain it, pure alcohol should be employed. A thin layer of cotton is placed over the whole. The advantages claimed for this method are the fact that the cord dries absolutely in an aseptic condition, that suppuration does not occur, and that the cord promptly separates.

Rupture of the Spleen During Pregnancy; Extirpation; Recovery.—SAVOR (*Centralblatt für Gynäkologie*, 1898, No. 48) reports from Chrobak's clinic in Vienna the following interesting case:

The patient was a multipara, thirty-one years old. She was about six months pregnant when she was kicked violently in the left side of the upper abdomen by a drunken man. This was followed by pain and shock, the patient being immediately brought to the clinic. On examination no fracture of the ribs was present, nor was the area of dulness over the spleen increased. A positive diagnosis could not be made.

On the following morning there were marked tenderness and tympanites in the left inguinal region. The patient complained of severe pain in the left side of the abdomen. These symptoms steadily increased, with rapidly developing anæmia. Accordingly in the afternoon the abdomen was opened and blood was found in the peritoneum; the uterus was uninjured, but the spleen was ruptured deeply into its substance.

The incision was accordingly enlarged and the spleen removed. The patient reacted well, but was threatened with abortion, which was controlled and prevented by the use of opium. She made a good recovery, went to full term, and was afterward delivered of a fully developed child in spontaneous labor.

On examination, upon the anterior surface of the lower half of the spleen there was found a rupture which extended through the entire thickness of the organ. Bleeding had been partly controlled by a firm clot. Hemorrhage beneath the capsule had also taken place, and the pulp of the spleen was pale, and the capsule easily separated.

The Combined Trendelenburg-Walcher Posture in Obstetric Operating.—In the *American Journal of Obstetrics*, December, 1898, DICKINSON contributes an interesting and well-illustrated paper upon this subject. He has found that the combination of the Walcher and Trendelenburg postures is of the greatest advantage. In the absence of an operating-table, a chair without rungs between its back legs may be used for an inclined plane, and the patient may be prevented from slipping by means of a sheet passing over her shoulders, behind the neck, the ends tied to each rear leg of the chair. The buttocks project beyond the back of the seat, the patient's legs

are spread wide and dropped backward, and free access to the birth-canal is procured. The posture is especially favorable for anæsthesia.

In maternity hospitals the usual Trendelenburg table may be employed with a portion cut out, permitting access to the vulva.

He calls attention to several incorrect methods of using the sheet sling. This should be passed broadly across the back and tied on the outer side of each leg just below the knee. In this way the limbs are rotated outward.

Precocious Maternity.—In the *Montpellier Médical*, 1898, No. 45, VALMALE reports the case of a girl, aged thirteen years and six months, who was delivered of a full-term child in the clinic. She first menstruated when twelve years and eight months old, and conception occurred a month afterward. The child occupied the second position, the vertex presenting. The forceps was applied at the superior strait, and the infant, a male, safely delivered. It weighed 3700 grammes. Its length was 53 cm. The placenta weighed 550 grammes. The patient made an uninterrupted recovery.

This case is reported as an example of precocious maternity, although it is not especially remarkable, as several cases are on record in which the mother was younger than this.

Temperature in Eclampsia.—GMEINER (*Prager medicinische Wochenschrift*, 1898, No. 48) concludes, from a series of papers upon this subject, that fever always accompanies eclampsia when the attacks follow one another rapidly. The type of fever is remittent, and the temperature goes in many cases to 104° F. and above. Prognosis depends not so much upon the height of the fever as upon its persistence and progressive ascent.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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The Vaccine Bodies.—ARMAND HÜCKEL (Die Vaccinekörperchen. Nach Untersuchungen an der geimpften Hornhaut des Kaninchens. Zweites Supplementheft der Beiträge zur pathologischen Anatomie und zur allgemeinen Pathologie, 1898). This work, on the bodies found in the epithelial cells of the rabbit's cornea after inoculation with vaccine virus, forms a monograph of 148 pages. It is beautifully illustrated with four double-page colored plates, containing 179 figures, and represents three years' work on the part of the author. The field of labor chosen is small but elaborately worked

over, and the minutest details of every step of the work are given in full. The subject-matter is divided into three parts.

In the first part, which forms almost two-thirds of the monograph, the author reviews first the literature of his subject briefly, calling attention to the views of Guarnieri, Monti, Ruffer, L. Pfeiffer, and others who believe that the vaccine bodies are protozoa, and to that of Salmon, who claims they are derived from leucocytes. He then takes up his own experiments. With vaccine from four-day-old pustules on calves he inoculated the corneæ of seventy-six rabbits, thereby obtaining 130 preparations from which he prepared 24,000 sections. He studied the corneæ fresh and after fixation in Flemming's solution and in corrosive sublimate. The best stains were obtained with Biondi's triple stain after fixation in corrosive sublimate. Control experiments, such as burning or scratching the cornea, infecting with pus organisms, etc., proved negative in all of the twenty-two rabbits tried.

Experiments proved that rabbits were readily susceptible to vaccinia. Small pustules developed in four days after inoculation of the nostril, and healed in thirteen days; later inoculations on the same animal resulted negatively.

After inoculation of the cornea the conjunctival secretion increased up to the sixth day. If the primary injury was severe, ulcers were produced, but healed in a few days.

The inoculations were so arranged that the early lesions could be studied at intervals of six hours, the later lesions at intervals of twelve hours.

In the first six hours little could be noticed beyond the mechanical injury, the invasion of a few leucocytes, and the presence, as early as three hours after inoculation, of vaccine bodies.

In the next six hours the epithelium was swollen, leucocytes were numerous, and certain drop-like bodies from 1.5 to 5 μ in size appeared in the cells near the inoculation wound. Usually several were present in a cell, and they were surrounded by a clear zone.

In the next twelve hours the basal cells of the epithelium were much swollen and the vaccine bodies had steadily increased in number, especially in the upper layers of cells.

Study of the lesions at later periods showed the same peculiar affection of the epithelial cells spreading peripherally, where the same changes could be found that at first occurred in the centre around the inoculation wound. It was therefore possible to study the whole development of the lesion in one specimen in which the process was well advanced.

The author next treats in detail of the various bodies found in the cells. The colors given refer to those obtained with Biondi's triple stain.

The *naked bodies* have no envelope or border and are not surrounded by any granules or thread-like zone. They stain deeply with the ordinary nuclear stains, and are not easily decolorized. With Biondi's stain they are colored dark blue, as are the other bodies mentioned below. They are usually spherical in shape, have no definite structure, appear at first in depressions in the nucleus, later in the protoplasm, and vary greatly in number and size in a given cell.

A second form of body is surrounded by a homogeneous mantle which is of variable thickness and stains red.

A third form, which is the most abundant of all, is spherical, varies much in size, and is surrounded by red granules.

In a fourth form delicate, somewhat granular filaments extend outward from the central blue body and are inserted into the surrounding protoplasm of the cell.

Bodies also occur in the form of a half-moon, sickle, spindle, etc.; they are not infrequent, appear later than the spheroid forms, stain light to dark or purplish-blue, and are found close to the nucleus only. Usually they are not naked, but are surrounded by at least a few reddish granules.

Other forms than those mentioned are met with, but are rare. Careful study shows that all of these bodies undergo the same degenerative changes. They swell and stain more lightly, a progressive formation of vacuoles takes place within them, and they often become lobulated. The bodies in breaking down form granules and drops which stain red.

The cells containing these bodies may be well preserved when the bodies show marked degeneration, and *vice versa*. Sometimes the protoplasm of the cells shows a filamentous structure.

Fifteen corneæ were examined on a warm stage immediately after excision. The same bodies seen in hardened preparations could be made out. Careful examination of them failed to show any change of form or evidence of motion.

Of the micro-chemical reactions of these bodies the most interesting, perhaps, are that when treated with a saturated solution of common salt they disappear, while 5 per cent. acetic acid brings them out very sharply.

The second part of the work deals with the various hypotheses in regard to the nature of the vaccine bodies. Salmon believes that they are masses of chromatin derived from leucocytes which have gotten into the wound from the conjunctival sac. Others think they are derived from the nuclei of the epithelial cells or from extruded nucleoli. Many others, like Guarnieri and L. Pfeiffer, believe that these bodies are protozoa which are multiplying in the cells.

In the third part of his work Hückel advances the view that these various bodies are derived from the protoplasm of the epithelial cells, because while most of them lie in vacuoles in the protoplasm a few do not; these latter are usually sharply defined, but occasionally fade off into the surrounding protoplasm. On this account he believes that the bodies are derived directly from the cell protoplasm, and he finds additional proof for this view in the filaments which sometimes connect the bodies with the surrounding protoplasm.

He regards the various bodies as of equal importance; they arise in the same way, all lie generally close to the nucleus, react alike to reagents, and undergo the same degenerative changes. Various combinations of the different forms and transition stages between them are met with.

With various irritants it is possible to produce red but no blue bodies within the epithelial cells of the cornea. He therefore concludes that the blue bodies arise through the specific action of the vaccine poison, because they cannot be produced in any other way. He says that while his work is negative as to the nature of the vaccine virus, and throws no light on this question, it has cleared up the nature of the so-called vaccine bodies.

The Epidermoids and Dermoids of the Arachnoid of the Brain and Cord. — TRACHTENBERG (*Virchow's Archiv*, 154, ii. 274) reports a case of multiple cholesteatomata which certainly seems to be unique. A man, fifty-five years of age, suffered from progressive paralysis of his lower extremities for two or three years before his death. A clinical diagnosis of compression myelitis was made. The post-mortem examination showed a large number of firm, yellow granules and nodules of various sizes scattered along the posterior surface of the cord. At the lower end of the cord was a cystic tumor measuring 4 cm. long and 1 cm. thick, and filled with yellow, gruel-like material. Small nodules similar to those along the cord were found also at the base of the brain, over the left frontal lobe, and in the lateral ventricles; in the right they were especially numerous and large.

Examination of the tumor at the lower end of the cord showed its soft contents to be masses of fat. No epithelial lining to the cyst could be found. In the wall were fibrous tissue, smooth muscle-fibres, sebaceous and coil glands, fat-tissue, ganglion cells, and nerves. Some of the small cysts in the ventricles were lined with epithelium. The writer believes that some developmental disturbance must have occurred the whole length of the cord at the time of the closure of the neural canal; this view is strengthened by the fact that the tumors are all on the posterior surface of the cord. He concludes that his case strongly favors the views advanced by Bostroem in regard to cholesteatomata, namely, that those which contain no hairs are due to aberrant fœtal epidermic cells alone, while those that contain hairs are due to aberrant cells of the epidermis and cutis.

Bostreom believes that such a wandering in the central nervous system of fœtal epidermic cells, either alone or in combination with cells of the cutis, occurs quite frequently, but that the cells can develop only when they come in contact with the vascular pia or a plexus.

The New Formation of Elastic Fibres in the Intima.—JORES (*Ziegler's Beitr. z. path. Anat.*, 1898, xxiv. S. 458) publishes his interesting studies on the new formation of elastic tissue in endarteritis. He concludes that endarteritis is a compensatory process not only in the sense in which Thoma uses the term, but also with regard to the new formation of a functionally active elastic tissue for the vessel wall.

He produced, by ligating arteries in animals, a condition analogous to endarteritis in man. The ligated carotid arteries of rabbits killed twenty days after the operation showed a definite thickening of the intima. The intima appeared very cellular, and the cells were surrounded by a fine network of elastic tissue. This picture changed but little in the further course of the process. The elastic fibres developed early and not, as formerly held, in the late stages of endarteritis. The first formation was noted eight days after ligation. The elastic tissue appeared as extremely fine punctate lines in close relation to the protoplasm of the connective-tissue cells.

By Weigert's method he was able to demonstrate that the formation of elastic fibres occurs regularly in endarteritis thrombotica. In a vein of an amputation stump, six months after the operation, and often in phlebitis, he found numerous fine elastic fibres in the intima.

Jores does not hold the commonly accepted theory that the elastic tissue

is formed from intercellular substance, but believes that it arises directly from the protoplasm of the connective-tissue cells. He bases his view upon the following: (*a*) The early appearance of the elastic tissue; (*b*) the close relation of the youngest fibres to the cells.

General Infection by the Diplococcus Intracellularis of Weichselbaum.—GWYN (*Phila. Med. Journ.*, vol. ii. No. 24) reports a case in which, during life, the diplococcus was demonstrated in the cerebro-spinal fluid obtained by lumbar puncture, also in thick, yellow, stringy pus obtained from the knee-joint, and finally in the circulating blood. At the autopsy the micro-organism could be demonstrated only in cultures from the lesions in the meninges.

[This is the first case in which this micro-organism has been found in the circulating blood, and one of the very few in which it has been found in the joints.]

The Bacteriology of the Simple Posterior Basic Meningitis of Infants.—STILL (*Journ. of Bact. and Path.*, vol. v. No. 2) states the results of bacteriological examinations in eight cases of the above disease. In one case (in the healing stage, one hundred and fourth day) cultures were sterile. In the other seven he found a flattened diplococcus (in pure culture in six cases) corresponding, except in a few minor differences, to the morphological and cultural characteristics of the diplococcus intracellularis found in epidemic cerebro-spinal meningitis. The differences which he found are a great vitality, a more abundant growth in broth, and a less certain virulence. These differences are so slight, however, that he believes they may be accounted for by a natural variation, and considers the organism found by him to be identical with the diplococcus intracellularis of Weichselbaum. The cases of simple basic meningitis of children are, therefore, to be regarded as sporadic cases of epidemic cerebro-spinal meningitis. Clinical observation as well as the gross anatomy and the results of bacteriological examinations favor this view.

In four of the cases there was a periarthritis. A bacteriological examination was made in one case, and the exudate was found to contain the same micro-organism as was found in the meningeal exudate.

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